

AMAZING STORIES

OCTOBER, 1935

25 Cents



Another Dimension

by GEORGE H. SCHEER, Jr.

MILES J. BREUER, M.D.

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“FOR THE FIRST TIME IN MY LIFE **WOMEN MADE A FUSS OVER ME**”

*wonderful to realize that charming
 found me interesting . . . wanted to be
 Always before I had been left out of
 . . the No. 1 wallflower of the town.
 be that this wonderful change had
 ought about by reading a Listerine ad
 owing its sensible suggestion? There
 ther way of accounting for it.”*

DON'T TAKE A CHANCE

who are popular . . . men and women
 places and see things . . . make
 and keep them, are almost invariably
 Listerine. They are too sen-
 un the risk of having halitosis
 ant breath), the unforgiv-

able social fault.

Don't take the chance of offending others
 needlessly. Every morning and every night
 and between times before business or social
 engagements, rinse the mouth with Listerine.

Listerine instantly halts the fermentation
 of tiny food particles, said by a noted dental
 authority to be the cause of ninety per cent
 of odors, then overcomes the odors them-
 selves. The breath—in fact the entire mouth
 —becomes sweet, clean, and wholesome.

Don't rely on ordinary mouth washes
 which may be devoid of deodorant effect.

Use only Listerine which deodorizes
 longer. Lambert Pharmacal Co., St.
 Louis, Mo.



1 FIRST LESSON FREE

It shows how EASY it is to learn at home to fill a GOOD JOB IN RADIO



E. SMITH, President National Radio Institute, is the man who has directed the Home-Study Training of more men for the radio industry than any other man in America.



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"Before taking your Radio Course I was making \$18 a week. I came here three years ago and in 18 months I made about \$4,500 in Radio. I cannot say too much for the wonderful help I have received from N. R. I."

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619 Broad St.,
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"I only do spare time Radio work and average \$18 a week. People who in good times would buy a new Radio, now have one old one fixed."

STEPHEN J. DRAPCHATY,
407 Wunderlich Ave.,
Barberton, Ohio.

RADIO ENGINEER AT WSUI

"Upon graduating I accepted a job as serviceman and within three weeks was made Service Manager. This job paid \$50 a week. Eight months later I obtained position as operator at Station KWCR through your Employment Department. Now I am Radio Engineer at WSUI."

SYLVANUS J. EBERT,
University of Iowa,
Iowa City, Iowa.

Clip the coupon and mail it. I'm so sure that I can train you at home in your spare time for a good job in Radio that I'll send you my first lesson free. Examine it, read it, see how clear and easy it is to understand. Then you will know why many men with less than a grammar school education and no technical experience have become Radio Experts and are earning two to three times their former pay as a result of my training.

MANY RADIO EXPERTS MAKE \$40, \$60, \$75 A WEEK

In less than 15 years, the Radio Industry has grown from a few million to hundreds of millions of dollars. Over 300,000 jobs have been created by this growth, and thousands more will be created by its continued development. Many men and young men with the right training—the kind of training I give you in the N. R. I. Course—have stepped into Radio at two and three times their former salaries.

GET READY NOW FOR JOBS LIKE THESE

Broadcasting stations use engineers, operators, station managers and pay up to \$5,000 a year. Manufacturers continually employ testers, inspectors, foremen, engineers, servicemen, buyers, for jobs paying up to \$7,500 a year. Radio operators on ships enjoy life, see the world, with board and lodging free, and get good pay besides. Dealers and jobbers employ servicemen, salesmen, buyers, managers, and pay up to \$100 a week. My book tells you about these and many other interesting Radio jobs.

MANY MAKE \$5, \$10, \$15 A WEEK EXTRA IN SPARE TIME WHILE LEARNING

The day you enroll I start sending you Extra Money Job Sheets which quickly show you how to do Radio repair jobs common in most every neighborhood. Throughout your training, I send you information for servicing popular makes of sets. I give you plans and ideas that have made good spare time money—\$200 to \$1,000 a year—for hundreds of fellows. My Course is famous as "the Course that pays for itself."

TELEVISION, SHORT WAVE, LOUD SPEAKER SYSTEMS INCLUDED

There's opportunity for you in Radio. Its future is certain. Television, short wave, loud speaker systems, police Radio, automobile Radio, aviation Radio—in every branch, developments and improvements are taking place. Here is a real future for thousands and thousands of men who really know Radio—men with N. R. I. training. Get the training that opens the road to good pay and success.

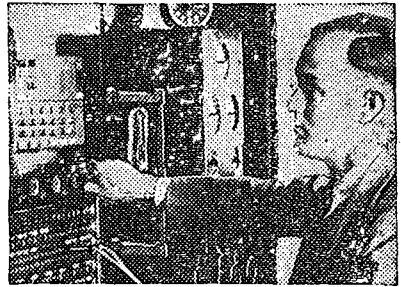
YOU GET A MONEY BACK AGREEMENT

I am so sure that N. R. I. can train you satisfactorily that I will agree in writing to refund every penny of your tuition if you are not satisfied with my Lesson and Instruction Service upon completion.

FREE 64-PAGE BOOK OF FACTS

Mail the coupon now. In addition to the sample lesson, I send my book, "Rich Rewards in Radio." It tells you about the opportunities in Radio, tells you about my Course, what others who have taken it are doing and making. This offer is free to any ambitious fellow over 15 years old. Find out what Radio offers you without slightest obligation. ACT NOW! Mail coupon in an envelope, or paste on a 1c post card.

J. E. SMITH, President
National Radio Institute, Dept. 51M
Washington, D. C.



You Get PRACTICAL EXPERIENCE with Radio Equipment I GIVE YOU

I'll show you how to use my special Radio Equipment for conducting experiments and building circuits which illustrate important principles used in such well-known sets as Westinghouse, General Electric, Philco, R. C. A., Victor, Majestic and others. You work out with your own hands many of the things you read in my lesson books. This 50-50 method of training makes learning at home easy, interesting, fascinating, intensely practical. You learn how sets work, why they work, how to make them work when they are out of order. Training like this shows up in your pay envelope—when you graduate you have had training and experience—you're not simply looking for a job where you can get experience.

I have doubled and tripled the salaries of many



MAIL THIS NOW!

J. E. SMITH, President,
National Radio Institute, Dept. 51M,
Washington, D. C.

I want to take advantage of your offer. Without obligating me, send me your Free Sample Lesson and your book, "Rich Rewards in Radio."
(Please Print Plainly)

NAME..... AGE.....
ADDRESS.....
CITY..... STATE..... "R"

The Tested Way to BETTER PAY

STATION UNIT when answering advertisements

AMAZING STORIES

Science Fiction

Vol. 10

OCTOBER, 1935

No. 6

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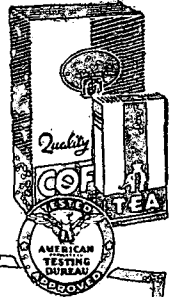
I WANT MEN

for TEA and COFFEE ROUTES

PAYING UP TO \$60.00 IN A WEEK

PROVEN PROFITS

YOUR earnings begin the first day. You can increase them from week to week and month to month. You have your own established Route of steady customers. There is no time clock to punch—no back breaking labor to perform. This is a pleasant, dignified, healthful outdoor occupation—a bona fide opportunity to make up to \$60.00 in a week for your full time and up to \$3.00 to \$5.00 in a day just for your spare time.



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These Tea and Coffee Routes offer bigger opportunities to make money than laundry routes, milk routes or bakery routes. You are not limited to just one or two necessities. You supply your customers with Tea, Coffee, Extracts, Spices, Kitchen Necessities—things people need daily. You offer valuable premiums and other amazing bargain specials to customers with these fine products. You deliver the goods—handle all the money and keep a big share for yourself as your pay. I send everything you need. You don't risk a penny of your money.

NO EXPERIENCE REQUIRED

Positively no experience is necessary to handle one of these Routes. No tedious training course to take. You must be trustworthy, conscientious, and willing to follow a few simple, common-sense instructions. I will show you all the inside workings of this Tea and Coffee Route business. I make the instructions so plain and simple that anyone who can read and write can quickly understand them and start earning money the very first day. Your Route can be right near your own home. Consumers—many of whom will be your friends and neighbors—will eagerly welcome the money-saving service you provide.

YEAR 'ROUND CASH EARNINGS

Think how wonderful it would be to have money rolling into your pockets

every week in the year. Imagine the feeling of independence and security you could have. Picture escaping the constant worry—that awful fear of losing your job and not knowing where your next dollar is coming from. With a steady Tea and Coffee Route, you can have the money you need to provide security, independence and freedom from financial worries. You don't have to wait—earnings begin the very first day.

GOOD OPPORTUNITIES FOR WOMEN

Both married and single women have been unusually successful in this light, pleasant business. Mrs. Ed. Koessler, Oreg., made \$61.00 in a week. Helen V. Woolmington, Pa., made \$45.00 in a week. Mrs. H. H. Hostick, Nebr., made \$41.73 the very first week. You can see from these exceptional earnings reports just how big the profit possibilities of my offer really are.

SEND NO MONEY—JUST NAME

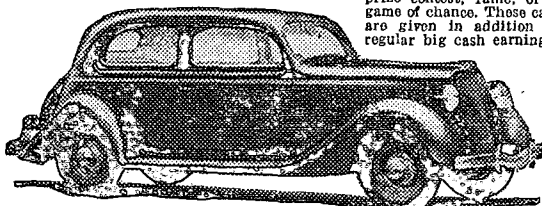
As quickly as I can hear from you I will lay startling facts before you and then you can decide for yourself. You be the judge as to whether or not my offer is fair. Investigate—positively no money risk. Costs nothing to know the truth. The facts I send you may be the turning point in your life. Put your name on coupon or penny postcard at once and mail.

FORD SEDANS GIVEN

I will give you a brand new 8-Cylinder Ford Tudor Sedan as a bonus if you show me you are a producer. This is not a prize contest, raffle, or a game of chance. These cars are given in addition to regular big cash earnings.

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These Tea and Coffee Routes are not an experiment. They are time tested and thoroughly proven money makers—the result of 28 years continuous success. Here are just a few exceptional earnings men have made on these Routes: L. P. Boyne, La., made \$67.20 in a week. Steve Witt, Mo., made \$21.59 in a day. George W. Creed, Ohio, \$95.00 in a week. Robert Bretscher, N. Y., \$78.00 in one week; \$25.00 in a day. Anasano Pardini, Calif., \$68.00 in a week; \$21.67 in a day. Albert Becker, Mich., made \$40.00 in a day and as high as \$100.00 in a week. Scores of others have sent me similar reports of their big earnings. Now I have an even better opportunity to offer you than these people had. You may do even better than they did. Better send me your name and find out what big earning possibilities my plan offers you.



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ALBERT MILLS, Route Mgr.,
7640 Monmouth Ave., Cincinnati, Ohio

Send me complete free details. Tell me about the Tea and Coffee Business and explain how I can get started making up to \$60.00 in a week without risking any of my money. Also send me your Ford automobile offer.

Name.....

Address.....

(Please Print or Write Plainly)

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A. C. Lewis

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ADDRESS
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Be an expert wrestler. Learn at home by mail. The greatest wrestlers of all, **Frank Gotch** and **Farmer Burns**, both world's champions have prepared the most wonderful course of lessons ever written on Physical Culture and Expert Wrestling. Be strong and healthy! Handle big men with ease. This great free book tells you how. Don't delay. Write now. State your age. **Farmer Burns' School, 3036 Elwood Bldg., Omaha, Neb.**

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Scribe N. Z. C.

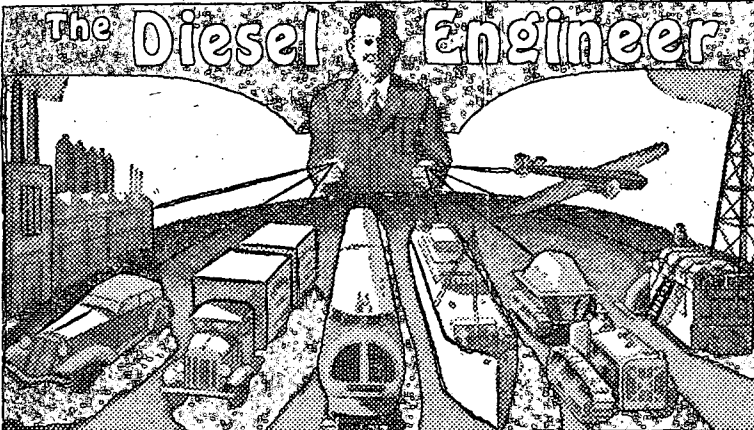
ROSICRUCIAN BROTHERHOOD

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(AMORC)

California

The Diesel Engineer



Is Your Job Safe

Just as the gasoline engine changed or wiped out the jobs of thousands who depended on horse-drawn vehicles for their living—just as electricity changed the entire set-up in the fields of light and power—so now the Diesel engine is fast invading both the power and transportation fields, and threatening the present jobs of thousands of workers.

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Diesel engines—because of their high efficiency, dependability, and economy of operation—are fast replacing steam and gasoline engines in power plants, motor trucks and busses, locomotives and ships, aircraft, tractors, dredges, drills, pumps, etc.—opening up an increasing number of well-paid jobs for Diesel-trained men. The field of Diesel Engineering is on the upgrade and continually expanding. It will provide steady employment and advancement for those properly trained in this new industry—as long as they need to work.

You get complete information on all the latest Diesel developments—two- and four-stroke cycles; low- and high-speed and heavy-duty types; Diesel-electric generating systems, etc.—in our course. Includes all text material—with special diagrams for quick understanding of this new power.

Now is your chance to get into a big new industry and grow up with it to an important position. Today there is practically no competition in the Diesel field, but the increasing use of Diesel engines will result in keen competition for jobs in three to five years. By starting your training now, you can keep ahead of such competition.

What This New Field Offers You

Get our Free Diesel Booklet and learn all about this newest, fastest-growing line—its opportunities and requirements. Find out what the Diesel field offers you—how rapidly the Diesel industry has developed during the last three years—the large number of Diesel engines and accessories being manufactured today—how easily you can obtain a complete understanding of Diesel engine principles and operation by home study during your spare time—without interfering with your regular work.


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John N. Ottum, Jr.
Box 95, Lisbon, N. D.



How do you know you can't WRITE?

Have you ever tried?
Have you ever attempted even the least bit of training, under competent guidance?

Or have you been sitting back, as it is so easy to do, waiting for the day to come some time when you will awaken, all of a sudden, to the discovery, "I am a writer"?

If the latter course is the one of your choosing, you probably *never will write*. Lawyers must be law clerks. Doctors must be internes. Engineers must be draftsmen. We all know that, in our times, the egg does come before the chicken.

It is seldom that any one becomes a writer until he (or she) has been writing for some time. That is why so many authors and writers spring up out of the newspaper business. The day-to-day necessity of writing—of gathering material about which to write—develops their talent, their background and their confidence as nothing else could.

That is why the Newspaper Institute of America bases its writing instruction on journalism—continuous writing—the training that has produced so many successful authors.

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NEWSPAPER Institute training is based on the New York Copy-Desk Method: It starts and keeps you writing in your own home, on your own time. Week by week you receive actual assignments, just as if you were right at work on a great metropolitan daily. Your writing is *individually* corrected and constructively criticized. A group of men, whose combined newspaper experience totals more than 200 years, is responsible for this instruction. Under such sympathetic guidance, you will find that (instead of vainly trying to copy some one else's writing tricks) you are rapidly developing your own distinctive, self-flavored style—undergoing an experience that has a thrill to it and which at the same time develops in you the power to make your feelings articulate.

Many people who *should* be writing become awe-struck by fabulous stories about millionaire authors and, therefore, give little thought to the \$25, \$50 and \$100 or more that can often be earned for material that takes little time to write—stories, articles on business, fads, travels, sports, recipes, etc.—things that can easily be turned out in leisure hours, and often on the impulse of the moment.

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BALLOON TIRES

Size	Rim	Tire	Tube
29x4.50-20	\$2.05	\$0.80	
29x4.40-21	2.15	.80	
30x4.50-21	2.25	.80	
28x4.75-19	2.30	.90	
29x4.75-20	2.30	.90	
29x5.00-19	2.65	.95	
30x5.00-20	2.65	.95	
28x5.25-18	2.65	1.05	
29x5.25-19	2.65	1.05	
30x5.25-20	2.65	1.05	
31x5.25-21	2.95	1.05	
28x5.50-18	3.15	1.05	
29x5.50-19	3.15	1.05	
30x6.00-18	3.25	1.05	
31x6.00-19	3.25	1.05	
32x6.00-20	3.30	1.15	
33x6.00-21	3.45	1.15	
31x6.50-19	3.40	1.25	
32x6.00-20	3.50	1.25	
34x7.00-20	4.35	1.50	
34x7.00-21	4.35	1.50	

CORD TIRES

Size	Tire	Tube
30x3	\$2.00	\$0.65
30x3 1/2	2.25	.75
31x4	2.95	.85
32x4	2.95	.85
33x4	2.95	.85
34x4	3.25	.85
32x4 1/2	3.35	1.15
33x4 1/2	3.45	1.15
34x4 1/2	3.45	1.15
30x5	3.65	1.35
33x5	3.75	1.45
35x5	3.95	1.55

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Size	Tire	Tube
30x5 6 ply	\$4.25	\$1.95
30x5 8 ply	5.25	1.95
32x6 8 ply	6.95	2.75
32x6 10 ply	7.95	2.75
36x6	8.95	3.95
34x7	9.95	3.25
36x8	11.45	4.95
40x8	13.25	4.15

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Size	Tire	Tube
7.50-20	\$6.95	\$3.75
8.25-20	8.95	4.95
9.00-20	10.95	5.65
9.75-20	13.95	6.45

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Send \$1.00 Deposit with each tire ordered (\$3.00 on each truck tire). Balance C. O. D. 5% Discount if you send cash in full with order. 12 months guarantee.

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Operator No. 33

FOLLOW THIS MAN

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T. O'CONOR SLOANE, Ph.D., *Editor*

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Extravagant Fiction To-day Cold Fact To-morrow

Meters, Barleycorns, Feet, Paces and Other Measurements

By T. O'CONOR SLOANE, Ph.D.

IF we look at the list of units of measure in use in different parts of the earth, we will find that the list is of astonishing length. It would seem that some time in the future there will be more unity, but at the present time, although constant efforts are made to bring it about, they are quite unsuccessful. During the epoch of very prosaic reform, incident to the French Revolution, a new unit of length was evolved, which was to depend upon a known cosmic factor. The earth is an almost true sphere and the unit of measure which was evolved in those days was the ten millionth part of the quadrant of the earth, the distance from the pole to the equator. This would have been much better if the planners had not attempted to get a unit based upon this quadrant, which after all was an unknown length and had to be specially measured in order to get the base for the length of the unit which

was to be called the metre, for naturally, the originators of this system were not satisfied with existing measurements of the quadrant. All that these measurements gave them was the approximate length of their unit.

So to get the exact length, the quadrant had to be measured and the measurement, simple enough in principle, demanded the utmost exactitude in its carrying out. The location of the line could be selected and the latitude of its north and south ends obtained with great accuracy. Of course, there was no idea of measuring from the North Pole to the Equator, but the exact determination of the latitude at each end gave a known integral portion of the quadrant. Now we know that the earth has a longer equatorial diameter than polar diameter. The quadrant of the earth, therefore, does not give a true circular arc, but it would have been just as good to have taken the true measurement of this

arc, whatever it might be, and calculate what part of the distance from equator to pole is represented taking it as a circular arc and to use that length to give the new metric unit. The almost obvious thing would have been to base the new unit on the length of the equator, taking one forty millionth of the circumference at the equator as the length of the meter.

Various measurements of these distances, arcs of the meridian, as they are called, have been taken, all with the most exact apparatus and the greatest care. No two of them came out alike, there was always an error, personal or instrumental, or due to changes in temperature and it may not be going too far to say that it was due in part to minute changes in the earth's contour as such changes would certainly invalidate the measurements. And there was always the elliptical shape of the meridian which affected the degrees' length. This was overcome in a practical way, which also may be accepted as a very accurate system, by taking what we may call a mean proportional part of a meridian situated with each end at similar distances, one from the North Pole and one from the equator. This was very cleverly accomplished by measuring the arc of the meridian extending from Dunkirk, situated on the south side of the British Channel, across France, through to the Balearic Islands in the Mediterranean. The distance from Dunkirk to the North Pole being almost exactly the same as from the Balearic Islands to the Equator gave them what we may call, a perfectly true average arc.

But after all efforts the meter as finally accepted was not the ten millionth part of a quarter meridian, but was just as truly an arbitrary meas-

ure as is the foot. It would have been much more sensible to have made the measurements on the equator where there would have been no question of change of diameter.

This is all modern history, but if we go back into old times, in different nations, it is then that we will be bewildered with the number of standards of measurement that have existed in the world. In our country, we have, in a general way, stuck to the English measurements, but even at that our gallon is different from the English gallon, being only eight tenths of it. The pound of water, which is supposed to be the pint, is the same in both countries, but when automobiling through England it should be remembered that in paying for a gallon of gasoline you get twenty-five per cent more than you do in America. These liquid measures go back to linear measures, each of them containing a definite number of cubic inches and referable to the inch or other linear dimension, as the case may be cubed.

The Standard Oil Company has a standard five gallon tin container for gasoline and kerosene and especially in the tropics, to the author's personal knowledge in Porto Rico, these containers, after being emptied, are used as a sort of bucket, being provided with a handle, so that they really are an important element in the economy of the country.

The old English tables of measurements contain some oddities; the inch was defined as three barleycorns as if any two seeds of a plant were of the same length. Then it contained the rod, perch or pole, it has three names, which is defined in the tables as five and one-half yards or sixteen and one-half feet. Both these dimensions may be found regularly given in the arith-

metic tables. Then the mile was given as 5,280 feet. This is an awkward number, but when expressed in yards, 1760 of them, it is a little better for the quarter of a mile becomes 440 yards, which is certainly more tangible than 1,320 feet. But it so happens that there is another mile which is the sea mile and this is often taken as 6,000 feet, properly 6080.20 in the United States, so when we are told that the Normandie can do 32 miles in an hour, if we reduce these miles which are sea miles, to land miles, we will find that she is going nearly 37 land miles per hour. There are many other miles varying from 1100 to 12,000 yards. There are even other sea miles, but all are so near 6,000 feet that it seems really a pity that one value cannot be settled on for all nations.

In determining the speed of a vessel at sea in old days, when ten miles was a very good rate if it could be sustained, a line was attached to a little board, ballasted so as to float vertically and this was thrown over the stern of the ship and the line was allowed to run out for a half minute or a minute as determined by a sand glass. Now half a minute is the one hundred and twentieth part of an hour and there were knots on the line bearing this ratio to 6,000 feet. The miles being taken at exactly that number of feet, the proportion was the same as for the half minute to the hour which is sixty minutes. The instant the last grain of sand went through the line was belayed or made fast and there was a sort of a trip that released the log from its vertical position and the line was pulled on board and the knots being counted gave the speed of the ship. It certainly was a very clumsy arrangement. This gave the origin of the word, "knot", as often used to

designate a sea mile, which of course is quite incorrect.

If we go back to the old days of Rome, we find an interesting unit of measurement, the *passus*, which is translated in English as the pace. The pace is the distance covered in walking, measured from the place where the heel of one foot leaves the ground to the place where the heel of the same foot touches the ground again. It is equal to two steps and there has frequently been some confusion between the pace and the step, one being one-half the other. The pace is about five feet. For long distance measurements, one thousand paces was taken as a unit, *mille passuum*, meaning one thousand paces, the plural genitive being taken with the numeral *mille*, so this last named Latin word gives us the origin of our word, the mile, and it also explains the curious length assigned to it of about five thousand feet. Where the two hundred and eighty feet, which appears in the mile's length (5280 feet), came from is far from certain.

There is a dimension on the surface of a sphere called the great circle which is the largest circle which can be drawn upon its surface. If a sphere be cut into two exact halves, the flat surface of each half is bounded by a great circle. Great circles can be located in any surface of a sphere and the distance between any two points of a sphere is shortest when measured on a great circle. This often puzzles travelers who will ask why cannot the ship go straight across from America to Europe or elsewhere in a straight line, forgetting that there is no such thing as a straight line on the surface of the earth. Many a sea captain has had his passengers put this proposition up to him. On a long sea voyage, the ship must change her course con-

tinually if she wants to keep upon the great circle, unless she is following the equator. There is no cutting across lots at sea.

It is quite interesting to look into the old measurements which are still used in many cases, but are in many cases virtually discarded. The curious specification for the inch, which goes back many generations, was the length of three grains of barleycorn, "dry and round." It apparently did not affect the views of our ancestors that no two grains of barley would be of exactly the same size and that it would be far from easy to say exactly where the length of the barleycorn was to be found, in other words, where its longitudinal axis was. But this wasn't enough, they also used the width of the barleycorn as a measure, which was supposed to be a fifteenth of an inch. The struggles of the French to get the fixed unit from the dimension of our globe which is not even a sphere, we have seen, also failed. The sizes of shoes are still referred to barleycorns, in other words two-thirds of an inch.

Barleycorns are not the only corns associated with shoes or with feet.

Then we come to the foot. Now there seems to have been only one real inch but there were a number of standard feet varying from eleven to fourteen inches. We have already spoken of the old table of linear measures that was taught us in our childhood. There we find the rod, perch or pole all meaning the same thing and thus adding a little confusion to the system, this unit being five and one-half yards or sixteen and one-half feet. It was used very much as a land measure; thus the measuring unit as we may call it of the surveyor was given by the chain containing one hundred links of steel joined by rings,

so that each link with its ring and a due allowance for the thickness of the metal represented 7.92 inches. The chain was sixty-six feet, or four rods in length. One hundred and sixty square rods is the acre. Some of the old chains were quite curious in their details. They would sometimes have a level at one end, so that one of the end men, by pulling at the chain, would get the bubble in the level at its center of the glass tube, and then it was assumed that the chain gave the right standard length of sixty-six feet.

There seems to have been a certain fondness for chains which certainly are a very unmechanical contrivance, because they are affected by the changes of temperature and by the wearing away of the metal and so an old chain would inevitably be longer than a new one. Even the engineers had their chains with one hundred links and 100 feet long.

Everybody is familiar with the acre, though it is doubtful if many carry in their minds how much it measures on a side. We have seen how the first definition of the inches, based on barleycorns and the acres was in old times defined to be what a team of oxen could plough in a day. This, of course, was not worth calling a measure of area, because it would vary in size with the natural gait of the oxen, some of whom are much faster than others, and it would also vary with the nature of the ground whether it yielded easily to the plough and whether the oxen could move along rapidly (assuming that a yoke of oxen was ever known to do so), but at last by some effort the area was brought down to a definite number of square feet and in a square mile there are 640 acres.

When we look in the dictionary and

find about 625 different measures given, it certainly seems as if the world could get on with fewer. Here and in England we cannot adopt with any general concurrence the metric system and so we stick to the old English measurements with some absolutely unnecessary changes. We have seen how the two gallons vary; the English have what they call a hundred weight whose distinguishing feature is that it is not a hundred weight at all, being 112 pounds when it ought to be 100. In stating his weight, an Englishman does not give it in pounds, but in stones with a few pounds more or less as the case may be, the stone being fourteen pounds. For the height of a horse a unit called the hand, four inches in length is used. Thus a sixteen hand horse measures five feet four inches in height. It seems that we will never part from

the foot and the hand as units of length.

For many years efforts have been made to introduce the metric system in America and England and it certainly should be done, but it is very hard to get mechanics away from the inch and its divisions. It certainly seems that the millimeter is just as good as the sixteenth of an inch for measurements on the lathe or other machine tool, but the change from the old system to the new, is every year more difficult as more and more products are referred to the everyday American or English units. As it is now, America is a little better off than the English in not having so many old time units which may be fairly termed freak units. An analytical chemist does all his work, with few departures, in the metric system and this applies to a vast range of scientific work.



The Distances of the Stars

Light "travels" at the rate of 186,000 miles per second in round numbers. This could be used as a unit of measurement for solar system distances, it would be the light-second. It would give the distance of Neptune from the sun as nearly 16,000 light-seconds. So the mile could be dispensed with for measurements in the solar system. Our earth would have the respectable figure of about 500 light-seconds as its distance from the sun.

But what about the distance of the stars from the earth? Alpha Centauri, which is the nearest known, has its

distance stated, not in miles, nor in light-seconds, but in light years. Multiply a light-second, 186,000, by the seconds in a year and you will have the value of a light-year in miles. Multiply this by four and a quarter and you will have the distance of our nearest stellar neighbor, Alpha Centauri, in miles. We leave the multiplications to our readers. The figure is so large that it is evident that miles cannot be used for stellar distances. Other stars are far more remote than this one, so astronomers use the light-year as their unit when they leave the study of our lonely little solar system.

A Legend of Posi and Nega

By JOSEPH WM. SKIDMORE

The planetary atom has furnished a world of romance to this author and the Posi and Nega stories, which have now appeared a number of times, in AMAZING STORIES, have been highly appreciated by the readers and by the editor of this magazine. We are very glad indeed to present these chapters to our readers.

Proem

THIS day, my weak pen poises uncertainly as I record another adventure of Posi and Nega. I am oppressed with a painful realization of my vast lack of literary skill and scientific knowledge. I have the futile, embarrassed feelings of a man suddenly called upon to explain relativity to Prof. Einstein!

You have endured with me in admirable patience as I have, in past episodes, unfolded the atomic emotions and adventures of the tiny, unsophisticated Nega and the irrepressible rogue of a Posi. You have followed the tiny beings from space to earth, from the sewer to the skies, and from atom to atom.

Posi is an irresponsible, temperamental little rascal; it is difficult to persuade him to relate his adventures to me; for he rightly considers me a very poor amanuensis. Posi tells me he once lived in the brain box of the mighty Caesar—and was wont to dictate to six scribes at one time! And then, too, Posi tells me many things in pledged confidence, which I may not reveal.

But, I'll do my best to describe the realms of the infinitely small—the world, of timed, whirling, vibrating, numerically-ordered electrons, in which live Posi and Nega.

For nothing is ever impossible—it can only be infinitely improbable.

J. W. S.

Conspectus

POSI, the proton, and Nega, the negative electron, were first met in the cold places of space, where the absolute zero facilitates crystal-making—or atom-building. The two tiny beings were mothered by the mysterious cosmic rays and fathered by that incomprehensible energy which gives life and motion to all matter.

Posi and Nega were drifting in the absolute zero of space as an unassociated proton and electron, when helium cosmic ray bands were released; thus the two were drawn together, with three other protons and three more negative electrons to make up a helium atom.

Posi, who smugly fancies that he is the Don Juan of the atomic universe, was at once attracted by Nega's trim, round mass and the young, green color

vibrations of her lovely, flashing orbit

In the first eons of their romance they lived a happy care-free life; oscillating weird, strange dances of love, and vibrating, happy rondos.

It was not crowded in their helium atom: there were only four protons (positive electrons) in the atom's nucleus, with two negative (free, orbital) electrons circling and two nuclear electrons balancing the nucleus.

Posi was 1845 times heavier than the radiant, vivacious Nega; but the inscrutable intelligence has vested negative electrons with miraculous powers.

Posi, the positive electron, is male; Nega, the negative electron, female—as it is in human life.

Drifting in space, Posi and Nega had a very narrow escape from the horrible dangers of being drawn into the blazing sun. Fortunately a giant space car, en route to Earth, picked them up—just in time.

The space car collided with a vast meteor; and both instantly fused into a molten ball of iron and plunged 1400 feet deep into Arizona soil. The terrific heat and pressure from the mighty collision transmuted Posi and Nega into an iron atom.

Finally, after centuries passed, a party of earth scientists dug a shaft to the buried meteor, and took specimens for laboratory tests. Posi and Nega were in one of the specimens; and they were subjected to the bombardment of an alpha-ray device. This device of the scientists shot deadly rays, sworded with millions of volts of electricity, through the iron atoms.

Their iron atom was destroyed by the awful debacle of miniature solar systems which followed; and Posi and Nega were hurled into the lead lining of the "atom smashing" laboratory device. Again the heat, shattered systems, and the immutable chemistry of nature trans-

mutated them; this time they became a lead atom.

Their mass of lead was sold to an ammunition factory; and Posi and Nega became part of a revolver bullet. A human used their lead bullet to destroy another human. By a very clever device, Posi and Nega, aided by countless billions of other electrons, brought the murderer to his tellurian justice!

A great bomb exploded; and Posi and Nega were literally blasted into an atom of oxygen.

In their new oxygen atom they drifted into the window of a tellurian hospital; and their atom was breathed in by a patient suffering from typhoid fever. Posi's rage knew no bounds when they reached the stomach of the diseased human! Here they were attacked and devoured by a *Typhosus Bacillus*!

Posi was nearly insane with rage and indignation when their oxygen atom passed through the dying human's alimentary system—and into a sewer!

From the sewer they were washed into the Pacific Ocean, where they had many thrilling adventures. One lucky day they drifted to the surface, and were evaporated by the sun. Their mass of water vapor, on its way to the clouds, was decomposed by the electricity of a lightning discharge, and was struck by a speeding tellurian airplane.

Posi and Nega's life in this tellurian's body proved to be a series of amazing adventures: the human was a mad scientist, who was about to destroy the entire universe with a scientific, cosmic short-circuit of atoms!

Our tiny adventurers, aided by many trillions of other electrons, destroyed the insane scientist by the simple expedient of changing the selenium atoms in his body to arsenic atoms!

The dead scientist was cremated; and Posi and Nega were transmuted by the fearful heat into a carbon atom. For

some time they drifted in the atmosphere as soot—in a cloud of smoke. Their carbon atom settled on a mighty, tellurian dirigible air-ship. The air-ship flew out over the sea, and was wrecked in a terrific storm.

Posi and Nega, in their carbon atom, were in free atmosphere when a severe lightning storm was generated in their area. The lightning, flashing from clouds to earth, struck a large mass of carbon atoms, and flung them to earth with fearful force. This bolt of lightning, carrying the mass of carbon atoms, struck a granite mountain which was partly covered with a large glacier. The heat and pressure of this mighty impact, instantly followed by the glacier's cold, caused Posi and Nega's carbon atom to combine with billions of other carbon atoms into octahedral crystals of the cubic system: thus Posi and Nega were suddenly part of a magnificent but uncut diamond! By this time, Nega developed a tender, but determined, sentiment toward Posi—a feeling of a connubial nature! But the clever Posi is wary of conjugal traps!

In their splendid diamond Posi and Nega had many strange adventures: humans found their rough diamond, and had it faceted or cut and polished by a famous lapidarist. The great value and beauty of the diamond aroused the desires of certain unscrupulous humans: several died violent deaths, scheming for its possession.

Finally, Posi and Nega's diamond was purchased by a very eccentric billionaire, who had spent all his wealth for diamonds to construct himself a tombstone! He planned to burn the diamonds by heating and burning them in oxygen. He proposed to run the carbon dioxide, arising from this combustion, through a solution of lime water; from the precipitated calcium carbonate, which is marble, he intended to build the cost-

liest and strangest tombstone ever built!

Fortunately, Posi and Nega escaped from the device in the form of carbon dioxide gas, and as such drifted in the air, until their carbon dioxide molecule was eaten by a tree! The tree, by the process of photosynthesis, converted their carbon dioxide molecule along with water into starch for food.

For years Posi and Nega in their carbon atom lived in the tree, which in due time died of old age.

A termite white ant ate some of the wood pulp containing Posi and Nega. The wood pulp in the ant's stomach was in turn eaten by a tiny microbe. Millions of these tiny microbes in the termite's stomach ate and digested the wood pulp; and the termite lived from the by-products of the microbes.

The termite ant was mortally hurt; and, in its death struggle, it ran into a near by hospital and crawled into a box containing the hospital's supply of radium. There the termite died.

Posi and Nega now suffered a dangerous ordeal: the beta rays, from the volcanic, turbulent hearts of the radium atoms, began to bombard their carbon atom! A crashing, exploding debacle of electrons followed! A proton and a negative electron, in Posi and Nega's carbon, were struck and destroyed! Their atom, now containing but eleven protons, six negative nuclear electrons and five negative planetary electrons, instantly became a boron atom! And the deadly beta rays were still streaming through their atom!

At that dramatic instant, a human scientist reached into the tiny box with a small pair of tweezers, and removed the pin-head sized particle of radium. The human said to his assistant:

"We must hurry with the cancer experiment. Why! Here's a dead termite in the radium box! I suppose it wandered in there and the radium killed it!

Here, hold the radium; I'll toss the dead termite into the incinerator!"

Thus we left Posi and Nega in the last episode: in their new boron atom—within the starch molecule—within the microbe—within the dead termite—and all in the human hospital!

Narration

"Sadr Cygni!" vibrated Posi. "We're in a boron atom! I've just established a new line of communication with Polect; now we'll get some news. I'm getting sick of being in this dead termite's body!"

"Boron," shimmered Nega, oscillating her flashing orbit, "what is boron?"

Posi had anticipated the question and the clever little rogue had already surreptitiously asked the aged, erudite Polect all about boron.

"Nega," urged Posi, in his most officious manner, "it's a pity your dumb but delectable sex is so ignorant! Boron is a non-metallic element; it's a brown, non-crystalline power. It is trivalent, and, like its cousin aluminum, it goes into various combinations quite readily. Boron forms an oxide, which with water forms boracic acid. Our atom of boron has eleven protons, or positive electrons like me, in its nucleus; and, of course, orbiting around our nucleus are five pretty negative electrons, of whom, you my sweet Nega are one. Nice girls, too, your four companion orbital electrons! Girls, are you listening closely to what I'm vibrating?"

"You senile, old flirt!" sizzled Nega. "Never you mind about the other negative electrons! For what purpose do the tellurians use boron?"

Posi glowed a sudden violet red of anger, as he blazed:

"To make a weak acid to wash out their sore eyes! We're having the worst luck. Wait! Here's news from Polect;

the human physician has taken our dead ant from the radium container! He has tossed our termite toward the incinerator! The fool wants to burn us all! Furud Canis! What splendid, good luck! His throw was bad; and we've landed in a bot of boiling, steaming mixture cooking on an electric stove!

"Polect tells me we've landed in a horrible sulphur mixture that these silly humans are brewing for medicine! What a sticky, disgusting mess! Our termite ant is disintegrating from the boiling compound; and our boron atom will soon be absorbed by the sulphur atoms!"

"Medicine," gleamed Nega; "what is medicine?"

"Humans take medicines," rasped Posi, "to help restore their broken down body cells, when their soft, weak anatomies become ill or damaged. This is just our lousy luck: I suppose some tellurian will drink us to cure his alcohol-hardened liver—or for a belly-ache! Or maybe they'll feed us to some young male brat who thinks he is in love—and has pimples on his face! I'm disgusted! I—"

"Love!" bubbled Nega, in quick, excited interruption. "Posi, you promised to tell me all about love and marriage! Please tell me!"

"Oh, Meteor Dust!" twitched Posi, "what a fool I was to bring up the subject of love! Woman, regulate your oscillations! Control your pulsations! And pull in your orbit! You're only a child—barely a million years old! The idea of you speaking of love!"

"But Posi!" glittered Nega, angrily, "you promised to marry me, when we were in the carbon atom!"

"Perhaps I did," fulgurated the shrewd and evasive Posi. "Remind me of it—in about a thousand years! Here's important news from Polect—fortunately he is only a few billion atoms from us! He tells me the humans are

boiling up this awful compound to make a blood specific. Now they're boiling it under a high pressure! Feel our speed increase? Polect says this heat and pressure may transmute us into another kind of atom! I hope so; for this boron is such a stupid, uninteresting compound! Hold your orbit tight, Nega! Something is happening to our atom! See all those strange protons and electrons crowd into our atom and dart into new orbits and nuclear positions!"

Man can neither create nor destroy matter; but he may change it from one form to another!

The immutable law of Nature's chemistry prevailed: numerical, rhythmical order came out of the chaos and confusion in the boron atom!

Posi felt his vibrations and speed lessen in power; his round mass seemed in danger of being crushed from strange, intruding protons! The contact was strangely repulsive! With all his fast dissipating energy, Posi concentrated with one last powerful pull to Nega. Then electronic life seemed to cease; but cosmic energy, vibrating and incomprehensible, continued to flow through electrons—as it has since the Beginning of Things! The mighty, inscrutable law, which directs an atomic count to each element, reigned supreme! Now Posi and Nega were suddenly spinning and orbiting as usual—but in new positions and orbits!

For Posi and Nega had been instantly transmuted into an atom of sulphur!

"Rigel Orionis!" ripped Posi, "we came through that ordeal in fine shape! Are you all right, Nega, my darling? Polect says we're in an atom of sulphur! And look at all the new negative electrons we have in our atom! Hello, girls, I'm Posi! Cosmos! Now we have sixteen female electrons in our orbit! Hello there, Gevel, didn't I meet you on Venus in a platinum atom? Of

course I did! Swing your lovely orbit over and let's talk over old times!"

"Posi, you old roué!" seethed Nega, in a sudden, jealous rage. "So you're flirting again! Why, you couldn't be true to one woman for ten thousand years! Tell me about our new sulphur atom! Lots you care whether I'm all right, or not!"

"Now, Nega, of course I care," beamed Posi hastily, in his most amorous oscillations. "Don't be unreasonable—I just met Gevel, an old friend."

"I'll say she is old!" refracted Nega, spitefully. "Look at her fat mass, and her atmospheric rings are silver gray! But never mind; tell me about sulphur!"

"Sulphur!" blinked Posi, glad to change the topic, "is number sixteen in the atomic scale; its atomic weight is thirty-two and six hundredths. And, of course, you know by this time that in our sulphur atom there are thirty-two of us protons and sixteen negative electrons in the nucleus; and circling the nucleus are sixteen of you charming negative electrons to balance our atom. You realize, too, that I'm eighteen hundred and forty-five times as heavy as you, my pretty, orbital one!"

"Let's cease quarreling!" glowed Posi. "Sometimes an awful thing happens to an atom when its electrons fight among themselves! We might become an atom of positive electrification! Then we would become social outcasts among atoms!"

"Rings of Saturn!" twitched Nega, "what is positive electrification?"

Posi glowed violet and swelled his mass with mighty conceit; he raised the pitch of his vibrations that all the electrons in the sulphur atom might hear.

"A normal atom," pulsated Posi, in his most academic vibrations, "has its electrical charges in exact balance: the negative electricity of the negative electrons exactly equals the free positive

electricity of the protons, or nucleus; and the atom as a unit is electrically neutral. But if an atom loses an electron, or one of its electrons does not do its work properly, it becomes positively electrified. If an atom loses two electrons, it becomes doubly electrified and remains electrified until it has an opportunity to regain the lost electrons. An atom in such an unnatural state does not fit properly into the "wonderful scheme of things!"

"That would be awful!" flashed Nega. "I won't quarrel with you any more—if you don't flirt!"

"Of course I won't," sparkled Posi. "And now I'll tell you more about sulphur. At ordinary temperatures sulphur is a pale yellow solid. These foolish humans grind it to a powder and use it for medicine: hence we are in our sulphur atom in this tellurian sulphur compound. Sulphur is one of the tellurian's most useful elements; it combines readily with other elements, and is used for many practical purposes. We're sure to have exciting adventures, now that we're in this sulphur atom! Wait! Polect is sending me some important information!"

* * * * *

Sulphur has played a highly dramatic part in the history of man, particularly in the crude experiments of the ancient chemists, who vested sulphur with unearthly, supernatural powers.

Sulphur has made wars possible, and it is also a fine remedial element for man.

Early, devout philosophers associated hell with sulphur, which was known as brimstone. Brimstone is another name for sulphur, the discovery of which is lost in myth. These ancients, no doubt, got their idea of hell from seeing volcanos in eruption. All volcanos are a source of sulphur supply.

These ancients, seeing the sulphur

burning with its fiendish blue flames in the vicinity of volcanos, were probably inspired to create their gruesome ideas of Hades.

Sulphur is sometimes called brimstone, which undoubtedly means burning stone.

Many early writers were impressed with these traditions and superstitions. Even the great Bard of Avon wrote:

"My hour is almost come,
When I to sulfurous and tormenting
flames
Must render up myself." (*Hamlet*)

* * * * *

Nega was intensely proud of her beloved Posi for his pragmatic discourse on sulphur. She beamed proudly:

"Oh, Posi, you're so smart—and so handsome! But what will happen to us now?"

Posi ruminated deeply to consider the potentialities of their future; then he crackled:

"I suppose some sick human will drink us: in that event we may be buried with the human—if he, or she, dies. These tellurians only live about ninety years at the most. But, of course, we might land in the human's alimentary system! And get in the pesky ocean again!"

"But how could we get into the ocean from the human's body?" lighted up Nega, in excited curiosity.

"You dumb, female, orbital, negative, stupid electron!" flared Posi. "Don't you remember when we were in the oxygen atom, and we were breathed in by a human, dying from typhoid fever? Doesn't your silly consciousness remember that cursed adventure? Doesn't your empty realization recall how we landed in a filthy sewer, and were swept into the Pacific Ocean? But skip it; it's a disgusting topic; and, besides, a dumb cluck like you has no imagination and—"

"You—you awful wretch!" flashed Nega, in erubescence in rage. "You call yourself a positive electron—and a proton! You're only a moron; you're not so smart; you only know what Polect tells you! I'll never vibrate to you again!"

"Listen, Nega, my darling," twinkled Posi. "I was only joking—just to see you glow such a beautiful red! You're the sweetest negative electron I ever—"

Thus it went on and on for years: the tempestuous course of love! And all the while Posi and Nega, in their sulphur atom, were bottled up and remained on a storage shelf.

* * * * *

"The nucleus of any atom except hydrogen is a tight, little system, which may be compared to a family of energetic people in a perpetual family quarrel." (Bertrand Russell, F.R.S.)

In accurately describing the atomic life and conditions of Posi and Nega, the writer is met with various obstacles: man, even with the modern ultra-microscope, has never beheld an atom—much less the infinitely smaller electron. Then, too, this debile pen lacks literary skill; and the writer of this poor manuscript is floundering sluggishly at the bottom of a vast sea of yet unfathomed knowledge.

Erudite, determined, patient, inspired scientists have long labored with infinite pains and involved mathematics to establish facts. Although they have never seen an atom—or electron—the microscope, the photographic study of radio-activity, the use of the marvelous spectroscope, and the growing facts of chemistry have proven, with absolute, numerical precision, the atomic number and atomic weight of each of the known 92 elements.

One outstanding summation is that the atomic weight of any element is given by the number of protons (posi-

tive electrons) in the nucleus of its atom; and that the atomic number is the number of negative electrons orbiting around its atom's nucleus.

Now scientists, the glorious seekers of truth, have discovered neutrons, positrons, and deutons; but their exact status is not yet definitely proven!

Perhaps in the wonderful years to come, they will find that our little Nega, the negative electron, is made up of billions of molecules; which, in turn, are made up of atoms! Which, in turn, are made up of electrons!

As science advances, the structure of the atom becomes more complex: knowledge is growing like a mighty cathedral, in which the bricks of facts are laid up slowly—one at a time.

Democritus (420 B.C.), Epicurus (370 B.C.), both Greeks, and Lucretius (50 B.C.), a Roman, had an astoundingly clear, speculative philosophy of a world made up of atoms of a highly organized numerical system! All this without modern instruments and without proven facts! What glorious minds those ancient thinkers possessed!

Modern scientists, with nearly 2,000 years of proven experiments, and their modern apparatus, have direct, exact, quantitative measurements.

But this is not a scientific essay to conjure with abstruse problems, quite beyond the scope of our weak pen. It is a record of Posi and Nega, their emotions and adventures.

* * * * *

"Skat Aquarii!" glowed Posi, after a long silence. "At last, something is going to happen to us! One of the humans in this hospital is taking our sulphur medicine; the tellurian is sick, and is drinking us!"

"What's the matter with the poor human?" reflected Nega, sympathetically.

"Polect says the human has a fever arising from some blood disorder," ra-

diated Posi. "I'll have more news later. I suppose the human doctors in this hospital are giving our sulphur compound to improve the patient's blood stream. Here's important news from Polect: the sick human has swallowed us; and now we're in his stomach—being digested!"

"How awful!" glinted Nega. "Will it hurt us?"

"No," erged Posi; "the molecules of our sulphur compound may be absorbed and broken up by the human's gastric juices; but our sulphur atom will remain undisturbed. You will never know the difference.. Cosmos! Nega, we're in this human's blood stream! Now we're sure to have some exciting adventures!"

"Blood?" whirred Nega, greatly intrigued; "what is blood?"

"Blood," glowed Posi, importantly; "is the fluid which circulates in the principal vascular systems of humans and many other animals; the blood carries nourishment and oxygen to all parts of their bodies, and brings away waste products to be eliminated. Just now we're being pumped through this human's heart! Polect says he will have some interesting, exciting news soon."

"I wish I were a human," whistled Nega; "they are such interesting beings! I'd like to know more about their love life!"

"Sulafat Lyrae!" blinked Posi. "The idea of a happy, healthy electron wanting to be a silly, soft-bodied human! Where's your orbital pride? You must be losing your atomic consciousness! Don't you know that these tellurians only live to be about eighty years old? Their weak, soft bodies are easily destroyed by disease and disintegration; while we electrons live for millions of years, and are very hard to destroy! Some of us electrons get to visit other planets; while these humans have to

remain on their earth globe! Besides, we electrons live in a numerical, highly organized, harmonious state of community cooperation and mutual happiness; except in the case of radium and uranium atoms: these two crazy atoms have a perpetual civil war raging; but even they finally change into lead—one of the most durable, lasting, and contented of metals! We electrons can stand terrific changes of temperatures; but a few changes of temperature degrees causes a human to die! Nega, you should be ashamed of yourself!"

"I'm sorry, Posi," oscillated Nega, in red, embarrassed vibrations; "but I do wish you would tell me about humans—how they make love and get married!"

"Sabik Ophiuchi!" rasped Posi. "I see what is on your silly feminine mind! You are a—Cosmos! Here's news from Polect: our atom of sulphur is now part of a white corpuscle in this sick human's blood! Our white blood corpuscle, which these humans call a leucocyte, is now engaged in a desperate battle with a horrible monster of a trypanosome!"

"Heavens!" glimmered Nega, "what is a trypanosome?"

Posi raised the pitch of his vibrations, that all the negative electrons might hear, and flashed: "It's a dangerous, slender, parasitic worm of the flagellate protozoan family; these germs get into the blood of these humans and cause fatal diseases—and sometimes a human illness called sleeping sickness. Polect says this unlucky human was bitten by a rat, and thus became infected with these terrible trypanosomes. Polect says our white blood corpuscle is a terrific fighter; and has already devoured several of these invading disease monsters! The human's blood is infested with millions of the deadly germs; and they are multiplying with amazing rapidity! But don't worry, Nega: there are billions of our white corpuscles in this human's blood-stream;

and it's their task to kill these intruding horrors! Our sulphur molecules are sure death for these awful germs: sulphur is a sudden poison for all forms of germ life! All the while this fearful battle of microbes and white blood cells is raging, our white corpuscle is moving along with the blood stream through the human's body! The billions of white blood cells have sent an urgent message to the sick human's brain: they have asked the brain cells to speed up the human's heart—to help them with their mighty battle! The heart has responded, and is surging like a mighty engine! The human will now have more fever; but it is nature's way to help. Cosmos! Polect says a large group of the savage trypanosomes have attacked our white blood cell! What a brave fighter our Leucocyte is; it stretches out tentacle-like portions of its mass, and swallows the germs—one at a time—and engulfs them within its mass! There it gradually absorbs and kills the germs; or our sulphur molecules poison the wretches! Let's all of us protons and you negative electrons speed up our rotations—and hold your orbits exact: perhaps it will help our sulphur molecules to kill these beasts! We'll all do our part!"

"Accuse not Nature! She hath done
her part;
Do thou but thine."

(Milton)

* * * * *

The corpuscles in human blood are much like the common amoebas, the simplest form of life, and each having a nucleus. White blood corpuscles, leucocytes) have the amazing power of self-motivation: they can move about with an astounding amoeba-like movement, or they can change their shapes at will. These white blood corpuscles, which roam about in the blood in an independent existence, can stretch out arms and

engulf foreign bodies or disease germs! The white corpuscles are far less numerous than the red corpuscles; but they perform an extremely valuable service by exterminating disease animalcules, and forming blood clots after a cut, or wound.

The plasma of the blood is the fundamental substance mediating all nutrition. In it are dissolved the nutritive substances derived from the alimentary canal, the waste substances from the tissues, and the secretions of the various endocrin glands. Even the oxygen, which is bound by the red blood cells, is first dissolved in the plasma before reaching the cells. Pages of marvels could be written about blood; the red blood corpuscles (erythrocytes); the platelets (thrombocytes); blood dust (hematokonia); fibrin and its ferment thrombin, etc. But this is the story of Posi and Nega, within their sulphur atom, within the white blood cell (leucocyte). Posi and Nega's heroic leucocyte was but one of billions in the sick tellurian's blood stream. These hordes of mobile, unicellular glands are the savage watchdogs of the blood; they are always ready to battle to the death with any invading germ. Chemotactically attracted by devitalized tissue, bacteria, or other foreign bodies, these vigilant cells rush to the danger zone by their astounding amoeboid method of motion. And if any danger threatens the blood stream, these leucocytes fall with furious zeal upon any dangerous invader!

The deadly germs (trypanosomes) now came in a large group at Posi and Nega's white blood cell; but the brave leucocyte was a mighty warrior! It suddenly elongated its protoplasm-like body, and quickly wrapped its mass around three of the long-bodied trypanosomes, which were tearing at the leucocyte's soft body with their powerful fangs! Relentlessly as fate, the white

blood cell engulfed the attacking three germs. The three trypanosomes were doomed; they were securely imprisoned within the leucocyte's body, and its powerful acid ferments instantly began to digest the horrible germ monsters! And the sulphur molecules within the white cell helped to destroy the bacteria!

The gallant leucocyte was growing weak; despite the fact that, in a few minutes, it had enveloped and digested over a hundred of the trypanosomes! Hundreds of the invading reptile-like microbes were now slashing and gnawing at the white blood cell! Like killer whales attacking a mighty whale, they slithered through the blood plasma and imbedded their voracious jaws into the defender's soft flesh! Their incredible appetites knew no satiating; and now they closed in with renewed numbers and vigor! They tore great pieces of flesh from the leucocyte, which now assumed the shape of a tight, little globe for protection: it held that globular shape until the three unfolded, insphered germs were safely and completely digested!

The constant, vicious attacks of the horde of germs began to tell on the leucocyte: the greedy trypanosomes were surely and quickly devouring the blood cell! But suddenly the ever hungry attention of the trypanosomes was directed to a large group of red blood cells (erythrocytes) which pulsed by in the throbbing blood stream. These red blood cells had just traveled from the lung capillaries of the sick human; there the red cells had become filled with oxygen, which they were conveying to broken down body cells to exchange for carbonic acid.

For a few seconds the voracious trypanosomes were busy gobbling down the unresisting blood cells! These oxygen laden cells were a tasty morsel for the edacious germs!

Posi's and Nega's weakened, torn, and

war-wise leucocyte seized this chance to undulate along through the tiny artery to seek a more strategic position for the strange battle. It came to a sharp turn in the artery; but the leucocyte did not flow through the small bend; it suddenly and miraculously oozed through the tough wall of the tiny artery into the surrounding tissues! The leucocyte accomplished this astonishing feat by a process called diapedesis: it simply elongated itself until thinner than a needle's point, and slipped through an infinitely small pore of the artery wall; an opening so tiny that the passage of the white blood cell into the tissues did absolutely no harm! Blood corpuscles can accomplish this astounding passage through artery walls because of their amazing, elastic distensibility. These histological marvels—the leucocytes—do not function in the blood stream at all times: for the main part of their short, active life—about six weeks—they exist in the tissue surrounding the blood vessels. These remarkable, roving killers move about through the body at will; and they use the blood stream as merely a place of temporary sojourn, and as a means of transportation from one part of the body to another. But if the body, in which they exist, suffers a cut or wound, they rush to the injured area, and with fibrin clot the blood against excessive loss, and also liberate proteolytic ferments to destroy any bacteria which might seek to enter through the wound! Or if the blood stream is invaded by harmful germs, they rush out to become dauntless, savage killers!

Experiments have shown that these amazing white blood cells have some sort of self-directed intelligence—or a most highly developed instinct! Here is truly one of nature's most astounding high forms of cell life!

Posi and Nega's half-devoured leucocyte rested for a few moments in its

safe retreat. In an incredibly short time it digested the three dangerous trypanosomes; then it quickly restored its damaged torn tissues; now, it was trim, round, and active as ever!

Then with that uncanny, protoplasmic, undulating movement—like quicksilver squeezing through a leather bag—it melted through the artery wall into the pulsing blood stream!

Instantly many ferocious trypanosomes fell upon the revitalized leucocyte, which promptly opened up like a parachute and insphered two more unlucky microbes!

The fearful battle of germ monsters and white blood cells (trypanosomes and leucocytes) raged on throughout the diseased human's entire body! Countless billions of invading bacteria beasts against billions of the white blood cells!

This was a struggle to the death: either the invaders or the protectors must all perish! If the leucocytes destroyed the intruding horrors of microbe monsters, the human would live! If the disease germs succeeded in devouring all the home guard, the white blood cells, the human must die!

No quarter in the desperate fray was asked or given! This weak pen cannot adequately describe the titanic death grapples of those two vast hordes!

* * * * *

"Agena Centauri!" streaked Posi. "What a scrap our white blood cell is putting up! The brave chap has killed and eaten hundreds of the devilish monsters! Polect says this mighty battle is waging all through this human's body! This is one of the most exciting adventures I've ever had! I hope the leucocytes win; for if this human dies, we may be buried under the ground with his filthy cadaver! That would be just our lousy luck! Think of being buried under the stupid ground for years!"

"I wouldn't mind," sparked Nega, "as

long as you were in my atom. Oh, Posi, you're so smart—so handsome! Please tell me more about love and—!"

"Cursa Eridanusi!" simmered Posi, "what a time to speak of love! I'm interested in the outcome of this mighty battle of giants! Polect says our gallant leucocyte is in bad shape again: the hordes of hungry trypanosomes are literally eating it up! Our leucocyte is fighting madly; it is seizing and devouring the awful parasites as fast as it can! But it's a ghastly race for our poor, outnumbered, white blood cell! Polect says the mass of our heroic leucocyte is growing smaller and smaller from the constantly ripping fangs of the microbes! Savage, horrible fighters these trypanosomes with their long, thread-like bodies and heads like hammer-head sharks—they're practically all head and fangs! So our white blood cell is being eaten alive; in spite of the fact that it is steadily adding to its mass by the many microbes it is digesting! It looks like the finish for our sturdy chap of a leucocyte! Polect says he is growing old; and that his very short cycle of life is nearly done! Imagine living for only six of these tellurian weeks: and we electrons live as many million years!"

"You were right, Posi!" flickered Nega; "I would rather be an electron than a tellurian!"

"Zosma of Duhr!" scintillated Posi. "Here is news: our fighting leucocyte is dying from the awful wounds of battle and of weak, old age! Now the voracious trypanosomes are rushing in for the kill! Our brave white cell refuses to ooze through the artery wall and hide; it is going to fight to the bitter finish! Polect says it is doomed; for its amoeboid movements are now very slow and sluggish! They are tearing great pieces of flesh from our leucocyte, who has ceased to struggle! Here's good news from Polect: he says that

the white blood cells are defeating the invading trypanosomes all through the human's body! This is great news: the human is going to get well! Polect says the battle will go on for hours, but that the leucocytes are winning rapidly!"

"I'm so glad," streaked Nega; "I hate those awful microbes!"

"Algol Persei!" glittered Posi, with agitated oscillations. "Well, that's just too bad, Nega; for one of those disgusting trypanosomes has just eaten our sulphur atom along with a huge fragment of our dead leucocyte! This is simply disgusting! It's a disgrace to be inside this filthy, horrible germ!"

Posi's rage knew no bounds: he glowed a violent purple, and increased the speed of his rotation until he seriously disturbed the even, rhythmical balance of the sulphur atom. The remaining thirty-one protons in the sulphur atom's nucleus were forced to increase their flashing speed to compensate for Posi's erratic velocity: this caused the sixteen negative, planetary electrons to speed up and enlarge the periphery of their orbits in order to hold the atom's positive and negative electrical charges exactly equal.

The protons and electrons in the sulphur atom were all indignant because of Posi's foolish actions; and they set up a mighty, vibrating protest.

"Posi, you proton—I should vibrate moron," blistered Nega, across the mighty distance which separated them—a distance relatively as vast as from earth to the sun, "you're disturbing our atom's balance! Control your own oscillations! Where's your orbital pride? I'm ashamed of you!"

"Oh, Meteor Dust!" scorched Posi. "Don't you realize that we're inside the stomach of this nightmare horror of a microbe reptile? But I'm sorry I acted up like a mere child of only a million

years! I'll behave; but I still think it's an infernal outrage! Hold everything! Here's news from Polect: our loathsome trypanosome monster has attacked another gallant leucocyte! It's a furious death struggle! Our deadly germ swims in and out through the plasma and darts in to tear large pieces from the defending white blood cell! The awful beast, its stomach is already gorged! Cosmos! Our trypanosome plunged into a trap, that time! The smart leucocyte opened like an umbrella! The germ dashed in, its vicious jaws eager for flesh; the leucocyte folded over the germ—I mean us, too—and now our struggling trypanosome is doomed—it's being digested by the white blood cell's powerful, absorbing juices! And our sulphur molecule—and millions more—are helping to destroy the wretch! Now our leucocyte has slipped through an artery wall! It has digested our trypanosome; and now our sulphur atom is in the center of the leucocyte!"

"What will happen to us now?" impulsed Nega.

"I don't know," crackled Posi. "Polect says our new leucocyte is going to hide and rest here in the tissues for a short time. Polect has great news from protons all over this human's body: the leucocytes have killed nearly all the invading germs of trypanosomes! Victory is now certain; but, of course, there are many of those deadly microbes left to destroy!"

"Heavens!" buzzed Nega, "there must be lots of these brave leucocytes in this human's blood!"

"I'll say there is!" blazed Posi: "there's ten thousand of these noble, white blood cells, or leucocytes, to every cubic millimeter of blood! They're vast in size compared to you and me: a leucocyte is about one-twenty-five thousandth of an inch in diameter! There are many more of the red blood cells

in this human's body; they will number about five million to the cubic millimeter of blood! But don't think that is so many, Nega. Why, there are more of us protons and electrons in this leucocyte than there are leucocytes and red blood cells in all this human's blood stream!"

"I'm glad," zipped Nega, "that our poor, sick human is going to get well."

"Gienah Cygni!" flashed Posi, with sudden, excited oscillations. "We're going to have a most astounding adventure! I've had interesting experiences and unique hazards on many planets; but this is absolutely the most weird of all!"

"What is it, Posi?" clicked Nega. "Tell me!"

Posi glowed a deep, agitated red, and oscillated in humorous vibrations:

"Our leucocyte is about to reproduce—to produce offspring—to multiply!"

"Multiply?" flashed Nega. "Is our leucocyte a mathematician?"

"No, you dumb, female electron!" glittered Posi; "it's going to increase its kind—don't you see? It's going to reproduce itself by a wonderful process called mitosis!"

* * * * *

Huxley, the great savant, wrote that if six monkeys set to work strumming unintelligently on six typewriters for a million, million years, the ever-present factor of chance would cause the monkeys to write a verbatim copy of all the books in the British Museum! The law of probability would, in time, cause the six monkeys to write an exact copy of Shakespeare's sonnets—a product of the blind play of chance!

Therefore be encouraged, most patient reader, to bear with this debile pen. Perchance in the years to come my pen, guided by blind chance alone, will form words into potent, cogent phrases which will adequately describe the amazing,

electronic life of Posi and Nega. Monkey shall not out-do man!

"That power which erring men call Chance."

(Milton)

The mighty instinct to survive—to propagate its species—is dominant in all forms of life; be it insect, worm, plant, reptile, animal, amoeba or man.

One of the most amazing devices of nature to reproduce is the complex method of mitosis. By an incredible self-motivated process, plant and animal cells have the strange power of simply splitting into two parts and thus forming two perfect and individual cells! But the process is not simple: there are many strange and involved modifications of mitosis.

This poor pen will not attempt to describe such a difficult, technical theme. Perhaps we had best wait to see what the six monkeys will write? Or best, let's take heed to what the irrepressible Posi tells the unsophisticated Nega:

* * * * *

"Mitosis!" sizzled Nega. "What is that?"

Posi, shrewd little rogue, waited until he had communicated with the wise Polect; then he vibrated in harsh, important oscillations:

"Our brave fighter of a leucocyte, in which our sulphur atom is located, is going to reproduce itself by dividing itself in two parts! What a glorious adventure for us! The wonderful process is beginning now: a protoplasmic substance called chromatin is forming a reticulum at the center of our white blood cell! Nega, this leucocyte cell is both male and female within itself! Two centrosomes are enclosed in a centrosphere fastened above the nucleus of our leucocyte. Now! The two centrosomes are pulling away from each

other; the membrane, which enclosed the nucleus and the chromosomes, is breaking! Each centrosome, as it breaks away, takes with it half of the chromosomes! Now our entire leucocyte is dividing into two equal parts; and each portion has one of the centrosomes for its new nucleus! The centrosome in the center of our new leucocyte has again divided itself into two parts, in anticipation of the next cell division! There you are, Nega: you have been present at the birth of a leucocyte!"

"I don't understand any of it," blinked Nega. "You told me that humans secured a diamond and a gold ring for the female's finger, before they produced children! You said they fell in love first; that sounds romantic to me! I don't think this cell dividing business is a bit romantic! Tell me more about these humans!"

"Cujam Herculis!" pulsed Posi, in vast disgust, "you speak of love and those foolish humans, when I'm trying to explain one of nature's most astounding miracles to you! You're a stupid—Cosmos! Here's news from Polect: our new, young leucocyte has melted itself through the artery wall; and now we're once more in the blood stream. Our new leucocyte is young and full of vigor; and it is moving along eagerly looking for some trypanosomes to devour! But the pesky microbes are becoming scarce. Polect says we're now in a tiny artery in the sick human's finger."

"Where is Polect?" Nega refracted, suddenly. "How can you communicate with him? How does Polect know so much?"

"Merope Tauri!" blinked Posi. "You dumb, female electrons ask foolish questions. Listen to what I'm going to vibrate to you: Polect is a proton—a positive electron—like me; he lives in a sulphur atom a few million molecules

away from our sulphur atom, and his atom is also contained within the mass of our leucocyte. The mysterious electrical energy, which means life for you and me, flashes through our atom from positive to negative—and on and on—through surrounding atoms! So, when I want to communicate with Polect, I simply send vibrations along the electrical current which travels nearly as fast as light, even along dense metals that are made up of many electrons. Polect gets the messages and he replies in the same manner. Polect would get the message in time, even if he were on the other side of this tellurian globe!"

"Is that the way humans communicate with each other?" rippled Nega, in curious oscillations.

"No!" twanged Posi; "these silly humans converse with sound waves, which they set in motion with their vocal cords and mouths. These sound waves have to travel in atmosphere. And these sound waves, used by the foolish humans, travel at the incredibly slow speed of about eleven hundred feet per second! So we electrons can communicate to each other along the electrical current about one hundred and eighty times faster than humans! It's no wonder that they are so slow and stupid!"

"As for Polect, he's a very old and wise proton; he's over a billion years old, and has lived on many planets and in the brain box of several great philosophers. He once lived on this earth millions of years ago, when it was a glowing, seething globe of hot gas—like the sun! He is in constant communication with millions of protons; and he keeps us all advised."

"Posi," shimmered Nega, "why do we electrons live so much longer than humans?"

Posi considered mightily for proper vibrations to express himself; he erged in his most academic oscillations:

"Light travels one hundred and eighty-six thousand miles per second. Some of us high speed electrons travel nearly that fast! And Nega, my dumb but exquisite darling, strange, weird things happen to objects, masses, electrons, and tellurians when they begin to move at nearly the speed of light. Now you take one of these weak, soft-bodied tellurians and let him move through space at a velocity of one hundred and sixty-one thousand miles per second. On his globe earth, and moving at about his usual speed, his normal height would be about six feet—measured by his tellurian standards and yard stick. But a miracle would happen to the human if he lay down and moved at the rate of one hundred and sixty-one thousand miles a second; his girth and breadth would be of normal size, but his height would be only about three feet measured by the same tellurian yard-stick! A greater miracle happens to masses which travel at speeds closely approaching that of light: it is the more fundamental matter of *time*! And that wonder of wonders is this: time stands still for a mass moving at the speed of light! And the mass of that body, that is, its inertia, would increase with velocity, reaching infinity at the speed equal to light!"

"I don't understand," streaked Nega, with puzzled vibrations. "Tell me more about these humans and their love—"

"Cosmos!" crackled Posi. "All right, I'll tell you about humans; but I'll also tell you about the wonders of high speeds! Suppose that one of these humans left this Earth globe and traveled at the speed of light to the star, Arcturus. The human, you would think, would be a decrepit centenarian when he reached that distant star; but this is wrong; true, the journey would last about a hundred years, as figured by terrestrial chronology; but the speeding

human would arrive at Arcturus no more aged than when he started! If, then, the adventurous human could reverse his motion so that he could flash back to earth again, he would find that centuries had elapsed here, whilst he himself would not be a day older—for the round trip voyage would have lasted but an instant! And if the human took his watch along on the trip, the time-piece, traveling at light velocity, would not function at all! As the inertia of the watch movement increased, the energy pent up in the coiled spring would not be able to drive the mechanism. When the timepiece reached the velocity of light, its mass having reached infinity, the hands would not move!

"Don't you see, Nega? It's this way: as long as a body travels with the speed of light it has immortality and eternal youth! We have electrons traveling nearly as fast as light: so we live to vast ages! Most of us electrons travel about one hundred and sixty-one thousand miles a second, which makes our reactions, reflexes, thoughts, and acts much faster than those of sluggish humans! Now, do you not understand why we electrons live to such ripe, old ages?"*

"No," simmered Nega; "I don't understand a single vibration of it! Why don't you tell me how these humans make love?"

"Phaet Columbae!" flashed Posi. "It's no use trying to explain anything to such a stupid, negative electron! Nega, you're dumb as a human! Cosmos! hold everything; here is news! When I last heard from Plect, our leucocyte was in a tiny artery in the sick human's

*Author's Note: This theory that speeds approaching infinity cause electrons to exist for ages is a vagrant thought of the writer, and should be considered as such. However, the marvels of time and dimensions expounded by Posi are the exact and mighty conclusions of Einstein (Theories of Relativity); A. S. Eddington (Space, Time, and Gravitation), and Floyd L. Darrow (The New World of Physical Discovery). This poor pen is trying hard to hew to accurate scientific lines.
J. Wm. S.

finger.. But now we're having a real adventure: one of those inquisitive human scientists has taken a small sample of blood from the human's finger! And our leucocyte is in the blood that the scientist has taken from our sick human! The scientist has placed us on a glass slide; and he is looking at the blood smear through an ultra-powerful microscope! And our brave fighter of a leucocyte is quite dead! When the tellurian scientist made a slight incision on the human's finger, blood flowed. Our leucocyte, on hearing of the wound from the human's brain cells, rushed to the opening of the tiny wound. There, it deliberately ruptured itself to release its supply of thrombin! Thrombin changed the blood fibrinogen to fibrin. Thousands and thousands of blood cells became entangled in the fibrin network and a blood clot was formed to stop the bleeding! Thus our noble leucocyte perished—with hosts of his kind—at his duty! Leucocytes have the uncanny power of rupturing, or disintegrating themselves at will, when they wish to release their thrombin or proteolytic acids in a hurry! Polect says the scientist is now gazing at us through his microscope; he is examining the sick human's blood to see if they can discover the cause of the disease. The leucocyte, we lived in, had dissolved into tiny fragments. If the human scientist sees one of the live trypanosomes, he will know that that devilish monster is the cause. Cosmos! I'm glad we've escaped from that diseased human's body. I've a strong, positive feeling that we are about to have some new and amazing adventures!"

"Oh, Posi," snapped Nega, "can this human see us when he looks through his microscope? And what does he want to see us for?"

"Of course he cannot see us," flashed Posi; "they can't even see our molecule,

which is composed of two of us sulphur atoms. And they certainly can't see our atom—and much less me; for I'm but a very small thing compared to our atom! And there's no use of you glowing such a charming violet color or showing off your pretty orbit! Small chance you have of the human seeing you: you, who are eighteen hundred and forty-five times lighter than I am!"

"Heavens!" flickered Nega, "our atom is so small: I thought it was very large. These humans are surely vast in size!"

"Not at all," oscillated Posi. "In fact, they are also very small compared to most things. Humans are about half-way in size between the atom and the star. The mass of ten atoms raised to the twenty-seventh power represents the mass of the average human; and the mass of ten humans raised to the twenty-eighth power is equal to the mass of an ordinary star!"

"Humans are not so big or important, after all," radiated Nega.

"I'll tell the universe, they're not!" twinkled Posi. "They are really great folks; they are young in experience. Only a few million years ago they were but sluggish protoplasms in thermal swamps. They are destined to rule the universe because of their growing intellects and their miracle-working fingered hands with opposable thumb. These scientists are trying now to peer into our atom for precious knowledge: they are laboring at the bottom of a vast sea of yet undiscovered wonders. These brave, earnest scientists are advancing rapidly; they have established a wealth of basic facts. Because of their work with microscope, chemistry, and science, they have almost vanquished the germs and diseases which attack their weak, soft bodies. Their glorious discoveries and epochal proofs have saved humans from the cruel yoke of intolerant creeds and ignorant, superstitious

religions! Marvels of chemistry and science are available for these humans, because of these scientists who dared to search for reasons. If only we electrons could tell what we know! But a thousand years more and what wonders they will know!

* * * * *

This faltering pen is inspired by a profound and reverent wonder at the vastness of things—and the smallness of electrons, all whirling and moving in an incomprehensible but well-ordered scheme of life and motion.

What inscrutable force, what vast intelligence dominates and actuates the Universe, even to the intricate scheme of electrons, atoms, and molecules of matter? The same Intelligences, which directs and controls the orbital flight of the infinitesimal electron, holds the mightiest star-sphere in its timid and whirling circuits!

Surely all this marvel of numerically-ordered detail of electrons and the incredible rhythm of the stars is not a matter of mere chance or accident: one cannot contemplate the composition of matter, and behold the wonders of the heavens—and tolerate atheistic thoughts!

"Wonderworks of God and Nature's hand."—Byron.

* * * * *

"What will happen to us now?" simpered Nega.

"I don't know yet," flashed Posi. "Polect tells me that the human scientists are now looking at our blood smear in great excitement: they have located some of the deadly trypanosomes in the blood under the microscope lens! Cosmos! We may be in great danger soon: the scientists are going to put a powerful, destroying acid on our blood smear! The stupid fools are trying to see if the acid will kill the dangerous trypanosomes. This acid may disrupt our atom! I'll talk to Polect again."

Nega conversed with her fifteen companion, planetary, negative electrons, while she waited for Posi to obtain information. But Nega did not vibrate to the negative electron, Gevel, whom Posi had known for eons before in a platinum atom on Venus; for Nega was intensely jealous of Gevel. The unsophisticated, tiny Nega hated Gevel because she suspected that the amorous Posi was really fond of her negative rival in love. At times, Nega would become quite violent over the eternal triangle situation and would berate Posi. It required all of Posi's tact and shrewdness to keep Nega and Gevel from flying out of their orbits and tearing at each other's atmospheric rings!

"Oh, beware, my Lord, of jealousy;
It is the green-eyed monster, which
doth mock

The meat it feeds on."

(Shakespeare)

* * * * *

Posi suddenly vibrated sharp oscillations to Nega; he glinted:

"Nega, we're all right: the scientist used an acid on our mass of blood; but it did not harm our sulphur atom. Sulphur atoms are hard to disrupt. The acid killed all the deadly trypanosomes; they would have died very soon, in any case! The blood on the glass slide has dried up; and the scientist has taken the glass slide out of the microscope and placed us on a table. Now I suppose these human scientists will give the sick human some of the acid in the hope it will kill the trypanosomes in his blood stream, and thus cure his malady. I wish I could tell the meddling fools that the gallant leucocytes have just about killed all the vicious trypanosomes—and that the sick man is going to recover, anyway!"

"What will happen to us now, Posi?" vibrated Nega.

"Algol, the Demon Star!" projected

Posi, with angry oscillations. "The stupid human has dropped the glass slide to the floor and it has broken into several pieces! Our sulphur atom, along with millions of others, is on one of the broken pieces of glass; the dried blood holds us securely to the smooth glass. Now the dumb idiot of a tellurian is dumping us into a box of old bottles and broken test tubes! I'll bet we get into a human junk yard again—like we did when we lived in the lead atom! Oh, Meteor Dust! This is tough luck! I'm going to take a few months sleep!"

* * * * *

Time, mysterious and undefinable, moved onward in its mighty, relentless stream. Time! Is it energy, dimension, substance, or a mighty, flowing river of duration, in which our actions and thoughts appear for a moment and then vanish like a sinking ship?

Not knowing what time is, this ashenic pen will record that many tellurian-measured days passed, while Posi and Nega remained in their sulphur atom—on the broken glass slide—in the junk box—in the human hospital.

* * * * *

"Mizar Ursae!" glowed Posi, after a long, blue, stubborn silence. "Just as I told you! A tellurian junk man has picked up our box of broken whiskey bottles and glass scraps; he has taken us to a great tellurian glass factory! Our scrap of glass is being dumped into a vast furnace! We're going to be melted in this furnace into new glass: this awful place is a tellurian bottle factory! Cosmos! The humans have just dumped us into the blazing furnace! Nega, can you feel the speed of our orbits and rotations increase with the rising heat?"

"Will the temperature hurt us?" flickered Nega, anxiously.

"Not a bit," sparkled Posi; "but Polect says we may be changed into another atom! But you and I have been transmuted from one atom to another several times. It looks as though we're going to be imprisoned in some sort of a glass article that these humans need."

"Glass," gleamed Nega, "what is glass?"

"Glass," buzzed Posi, with smug importance, "is an amorphous substance, usually transparent or translucent, consisting ordinarily of a mixture of silicates, but in some cases it contains borates, phosphates, and salts. Most glass is made by fusing together some form of silica as sand—an alkali, as potash or soda—and some other base, as lime or lead oxide. Glass is hard and brittle when cold, breaking with a conchoidal fracture; but it softens when heated, becomes plastic, and finally melts. This glass—all-important to humans—was made on this earth as early as fourteen hundred years ago, before the time of Christ. I hope we will be made into a mirror; so that these humans, with their colossal conceit, can stare at us!"

"Oh, Posi!" glinted Nega. "I'm afraid; my orbital speed is increasing with the heat of the furnace! Our electrons are weaving around in their orbits in a strange, mysterious manner! Something is happening to our atom! Oh, Posi, hold me close! Change your usual force to that of your strongest pull to me! Hurry, Posi, our atom is breaking up!"

"Seginus Bootis!" whined Posi. "You're right, Nega; the chemistry of the heat is changing our atom! All the glass in this furnace is a seething mass! Our sulphur atom is changing! Our protons and electrons are darting about—taking new positions and orbits! Hold your orbit swift and true; and

tighten up your orbital periphery! Cosmos! There go four of the protons out of our nucleus! See them dart suddenly—fairly explode—out of our atom! I'm trying to get word from Polect; but there is too much confusion! and there go two of the negative electrons! Poor Gevel, she darted away from her orbit fast as light!"

"I'm glad that that fat Gevel is gone from our atom!" flashed Nega, who could not forget her personal feelings, in spite of the horrible confusion of electrons raging around her in the atom.

Of a sudden a vast peace and rhythmic system swept like magic through the atom: the incredible, immutable law of Nature's chemistry prevailed! Each proton and electron suddenly found its proper position and orbit; and started to live, vibrate, whirl, orbit, and oscillate in a well-ordered scheme of life and motion! Systems, vast systems, began to revolve with absolute numerical precision and certainty!

"Markab Pegasi!" shot out Posi. "Another miracle of transmutation has happened to us! I just got word from Polect! We lost four protons from our atom's nucleus and two of you negative electrons. That leaves fourteen of you negative planetary electrons and twenty-eight of us protons. Cosmos! Nega, that makes us a silicon atom!"

"Silicon," flashed Nega, "what is silicon?"

"Silicon," clipped Posi, "is a non-metallic element occurring abundantly in nature, always in combined form. It is, next to oxygen, the chief elementary constituent of the earth's crust. It melts at fourteen hundred and thirty degrees centigrade and can be cast like iron. Chemically, silicon is quadrivalent, and analogous to carbon. These tellurians use its compounds to make glass, porcelain, and cement. Silicon has an in-

satiable appetite for oxygen. Pure silica (SiO_2) occurs practically everywhere, either as such or as an integral part of complex molecules. It can almost be said that silica *is the earth*; for it actually composes twenty-six and eight hundredths percent of the crust of this earth globe! This silicon atom is a splendid system: we have more room to oscillate around a bit, if we want to play! We ought to have some interesting adventures in this new atom. Rings of Saturn! Our mass of molten glass is now being poured into molds! Hold your orbit, Nega: there we go into the mold; and our glass is slowly cooling. Now we're set as a solid; and, best of all, good, old Polect is located close to us—only a billion atoms distant! In the mix-up, Polect's atom was changed to one of sodium. He is well pleased with his new atomic home; he says—Cosmos!—that we are now part of a small glass bottle! Of all the cursed things—a bottle!"

"A bottle," cracked Nega. "Does it make you angry that we're part of a glass bottle?"

"I'll vibrate it does!" seethed Posi; "it's an outrage—an insult! To think that, I, Posi, should be part of a miserable glass bottle! I, who lived in a platinum atom on the moon; and where I kept delightfully intoxicated with the sun's powerful ultra-violet rays! I, who lived in a terbium atom even on the other side of the moon—no human of earth has ever beheld that sight! I, who lived in a golden atom on Venus—the planet of love! I, who lived in a thorium atom on blazing Mercury, with its surface temperature of seven hundred and fifty degrees Fahrenheit! I, who lived in an iridium atom on Uranus, where it's so cold the oceans are liquid air! Humans could not survive those extremes of temperature for a split second! Alas! I am reduced to this! Oh

Meteor Dust! Now I'm part of a common glass bottle, which some foolish tellurian will probably fill with booze to drink!"

"Cheer up, Posi," bubbled Nega; "I'm here with you! You know you promised to marry me some six hundred years ago! Oh, Posi, you're so smart and handsome! Tell me more about love and—"

"Alfirk Cephei!" glittered Posi, angrily. "I don't want to speak of love and marriage now! Besides, here's important news from Polect: a human druggist bought our bottle from the glass factory; and just now the druggist is putting some medicine in our little bottle for a customer, who is complaining of a sluggish liver! I thought sure some human would put wine in our bottle!"

"No man putteth new wine in old bottles; else the new wine doth burst the bottles, and the wine is spilled."

(Matt.ii.22.)

"What is wine?" glowed Nega.

"It's a delightful beverage for wise humans," twinkled Posi; "but it's a deadly poison for unwise humans who drink it to excess! That, no doubt, is the cause of the human's liver trouble. He has probably hardened that important organ with too much alcohol! Cosmos! here's news from Polect that will short circuit you! The druggist is planning to murder the customer with the medicine he is selling the human. The druggist hates the customer with a deadly, secret hatred! Polect has a line of communication with a proton in the druggists' evil, scheming brain! The druggist is going to poison the purchaser!"

"Heavens!" shimmered Nega. "How is the tellurian druggist going to commit this murder?"

Posi speeded up his rotations, and glowed his most important violet color; he projected:

"The druggist has persuaded the

foolish customer to buy calomel for his sick liver. Calomel is not considered a poison but—"

"Then how," interrupted Nega, with sharp vibrations, "is the druggist going to murder the customer?"

"By putting the calomel in our clear glass bottle," urred Posi. "The druggist is a chemist; he knows that calomel is a compound of mercury and chlorine. Each molecule of calomel contains one atom of mercury and one atom of chlorine. When exposed for some time to even feeble light, calomel undergoes a strange, deadly change: its molecules change so that they contain one atom of mercury and *two* of chlorine! This new compound, formed by the chemical action of light rays, is bichloride of mercury, more properly mercuric chloride, which is a sure poison for these soft, weak humans! The murderous druggist knows this, so he is putting the calomel in our bottle which is made of *clear* glass! He knows he should put the calomel in *opaque* glass which would not permit light rays to reach the calomel!"

"By the Beard of the Comet!" twinkled Nega, "this is all strange. Why does this tellurian druggist wish to murder the ignorant customer?"

"I don't know," blinked Posi; "Polect says it's all about an eternal triangle of some sort: it concerns a woman and love!"

"Oh, Posi!" crackled Nega, "tell me more!"

"Acrux Crucis!" rasped Posi, with short waves of vibration. "Now I've got you all out of your orbit again about this love business! Snap out of it, you dumb dame! Polect tells me the tellurian customer has taken our bottle home and placed us on a work bench. And, of course, the fool placed us where the sun's rays would strike right through to the highly dangerous calomel! This silly human is starting to take the

calomel; but, of course, it's not poison yet. This tellurian is an engraver and works at this bench under a strong light! In a few days this calomel will be a fatal poison! Polect is calling a conference of several trillion protons to see if this murder can't be prevented! We're going to try to get a message of warning through to this stupid human!"

"Rings of Saturn!" scorched Nega. "Can electrons communicate to humans?"

"Yes, and no," hummed Posi, in his most academic oscillations. "In the weak brain of this tellurian there are countless billions of protons. Under the direction of the erudite Polect, they will all set up certain powerful vibrations in exact unison. These vibrations are intended to act on the brain cells of the human: we are trying now to warn the poor fool about the calomel! It probably won't work. Protons for many eons have been trying to get a direct contact, or a line of communication, with human intelligences; but there is some vast barrier—some mighty, intangible obstacle which cannot yet be entirely surmounted. There have been millions of actual cases where the mighty, united influence of protons has, in a very slight measure, affected the consciousness, or mind of a human. But only so slightly that it merely caused the human subject to experience thoughts quite extraneous to his normal thought-life. Dreams—memories of the subconscious mind—the humans call these vagrant thoughts; but some of the more foolish humans only say the lobster, they had for dinner, upset their stomachs, and gave them bad night-mares! Billions of us protons are trying now to send warning thoughts into this tellurian's stupid brain! Polect says he is a very poor subject: his brain cells are sluggish and partly atrophied from disuse! Don't bother me for a few days; I'm trying to help Polect warn this ignoramus.

For some days Nega continued her busy, whirling, orbiting life: now that the hated Gevel was gone, she was quite contented with her speeding, flashing existence.

Nega played well her part in the great, orderly plan of life and motion. She—the tiniest, comprehensible particle of matter—played an important, integral part—a place as vitally important as that of the vast sun, whose rays were even now turning the harmless calomel into a vicious poison!

Finally Posi changed his deep red color to that of a joyous purple, and he sparkled:

"Rasalas Leonis! Nega, my lovely one, I believe our message of vibrations of warning to the human worked! Polect is not sure yet. This human is now at his work bench; he spent a bad night. Cosmos! he is about to take some of the calomel in our bottle; it is bichloride of mercury now, and it will kill him sure! The human is highly nervous this morning; his hands shake from his bad sleep. He can't find a spoon; so he has placed our bottle back on the bench and is picking up his tools to work! The fool! He can't work at engraving in his condition: we protons gave him a bad night of it!"

"Is the human going to take the poison?" twanged Nega, anxiously.

"I don't know, yet," ripped Posi; "at least, he isn't for the time being."

Posi stopped to receive a startling message from Polect. Posi swerved dangerously in his position and glowed in perturbed vibrations:

"Rukbat Sagittarii! Nega, we're doomed! This stupid, ungrateful human has ruined us! It may be the end for us! And we protons were the cause of our own undoing: we worked on this fool tellurian's brain and caused him to experience warning thoughts! All we did was make him nervous; and he has

fumbled with his shaky hands and dropped a heavy iron plate on our bottle of calomel! Cosmos! Nega, that is not the worst of it: there was a huge gutta percha container of hydro-fluoric acid on the bench, and the falling iron mass smashed our bottle and also the hydro-fluoric acid container! Now our smashed bottle, the calomel, and the awful acid is a pool of seething, smoking ruin on the bench!"

"That's fine!" flickered Nega; "now the human can't take the calomel—or I should vibrate, bichloride of mercury!"

"Botein Arietis!" sizzled Posi. "So it's fine, you dumb, female, negative electron? Do you know what that hydro-fluoric acid is doing to our broken particle of glass? Of course, you don't! Well, I'll vibrate it to you: hydro-fluoric acid (HF) is a deadly enemy to glass molecules; it attacks and disintegrates all silicates! Right now, this horrible acid is devouring our small particle of glass! At this moment the volatile acid is forming silicon tetra-fluoride (SiF_4) only a few thousand molecules away from us! In a few seconds, the acid will be eating at our very atom! Cosmos! Nega, this is the most fearful danger that we've ever faced! Hold your orbit true and tight, sweetheart! I'll pull you toward me with all my might as the acid rips into our atom! Yes, Nega, my lovely, negative darling, I'll marry you—if we come through this ordeal!"

"Then I don't mind any danger!" shimmered Nega, with true female sentiment and fortitude.

"Alphard Hydrae!" blazed Posi. "Here comes the acid into our atom! Hold tight to your orbit, my dear, little Nega!"

"Yes, Posi, my lover," gleamed Nega.

The protons and electrons in Posi's and Nega's silicon atom began to dart about with erratic movements as the

suffocating, devouring acid flowed into the outer rings of negative electrons! Two negative electrons dashed together to a mad, hurtling destruction! Then the deadly dissolving acid slithered into the protonic nucleus of the silicon atom! A mighty debacle of electrons followed, as the atmospheric space surrounding protons and electrons was filled with the pungent, suffocating odor of hydro-fluoric acid. Suddenly there was a vast, fulminating exploding upheaval in the whirling heart of the silicon atom—and chaotic, disintegrating confusion reigned supreme! Death stalked with acid electrons!

The tellurian engraver turned to his anxious wife and said:

"My liver is worse: last night I had dreadful nightmares! I dreamed continuously that Tom Jones, the druggist, was trying to stab me with glass daggers! He chased me all night! Silly, dear, wasn't it? By the way, I spilled acid all over his medicine; but I'm not going to take any more of his dope. I'm going to see Dr. Smith, to-day. Foolish things—these dreams: imagine good, old Tom trying to murder me!"

"We are such stuff

As dreams are made on; and our little life

Is rounded with a sleep."

(Shakespeare)

The End

Author's epilogical note: For the convenience of the reader, who is keenly interested in enlarging his, or her, knowledge of the sciences used in "A Legend of Posi and Nega," I have set below a partial list of references. These, I trust, will assist any ambitious student in the difficult climb up the technical ladder of knowledge. The science used in my "Posi and Nega" stories and other science fiction is the result of twenty years ardent study of

chemistry, physics, biology, and science—and I know but little!

The most important points of these sciences used in "A Legend of Posi and Nega" can be amplified by the use of the following splendid books:

General References

1. Webster's New International Dictionary (largest size current edition).
2. Encyclopaedia Britannica (current edition).

Special References

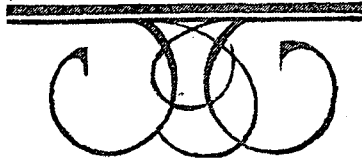
3. Sir James Jeans: A. Through Space and Time. B. Our Expanding Uni-

verse. C. The Stars in Their Courses

4. Millikan: The Electron
5. Russell: A B C of Atoms
6. Bailey: Text Book of Histology
7. Clarke: Marvels of Modern Chemistry
8. A. S. Eddington: Space, Time and Gravitation
9. Einstein: Theory of Relativity
10. Kendall: At Home Among the Atoms
11. Floyd L. Darrow: The New World of Physical Discovery.

Joseph Wm. Skidmore.

THE END


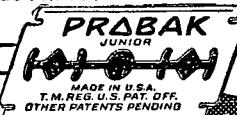


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Another Dimension

A Sequel to Beam Transmission

By GEORGE H. SCHEER, JR.

The author of this story is known to our readers and he made a very pleasant impression on them with his story entitled "Beam Transmission." Here we have quite a vivid interplanetary story, whose plot we must not tell, but which we are sure will be most acceptable to our readers.

"**B**ELL, you are simply becoming the most dissatisfied and uncomfortable man it has ever been my privilege to see or to work with!" This from Pearson who had been watching me closely for some time. "If anyone had told me that things would be as they are now, I certainly would have considered him completely out of his head. Do you realize that three or four of us own the world, run the governments, rule the people, everything! And all of this in six short years. Beam Transmission, Inc. is the biggest thing that ever could be. We do the world's shipping. Our new atomic power stations will heat and light the earth as well as furnish power to the whole blamed thing. There are no more railroads, not even for passenger service since people have come to consider beam transmission as safe for traveling themselves as for sending anything from a letter to a ton of bricks. If we were what we never shall be, we could do anything we desired to the earth. We own it now, but we do not brag about it. And all of this resulted from our thesis subject at the University six years ago! There you sit, sour as can be. What a parable."

"Go ahead, Pearson," I returned. "I have it all coming. As president of this outfit I should be content, I sup-

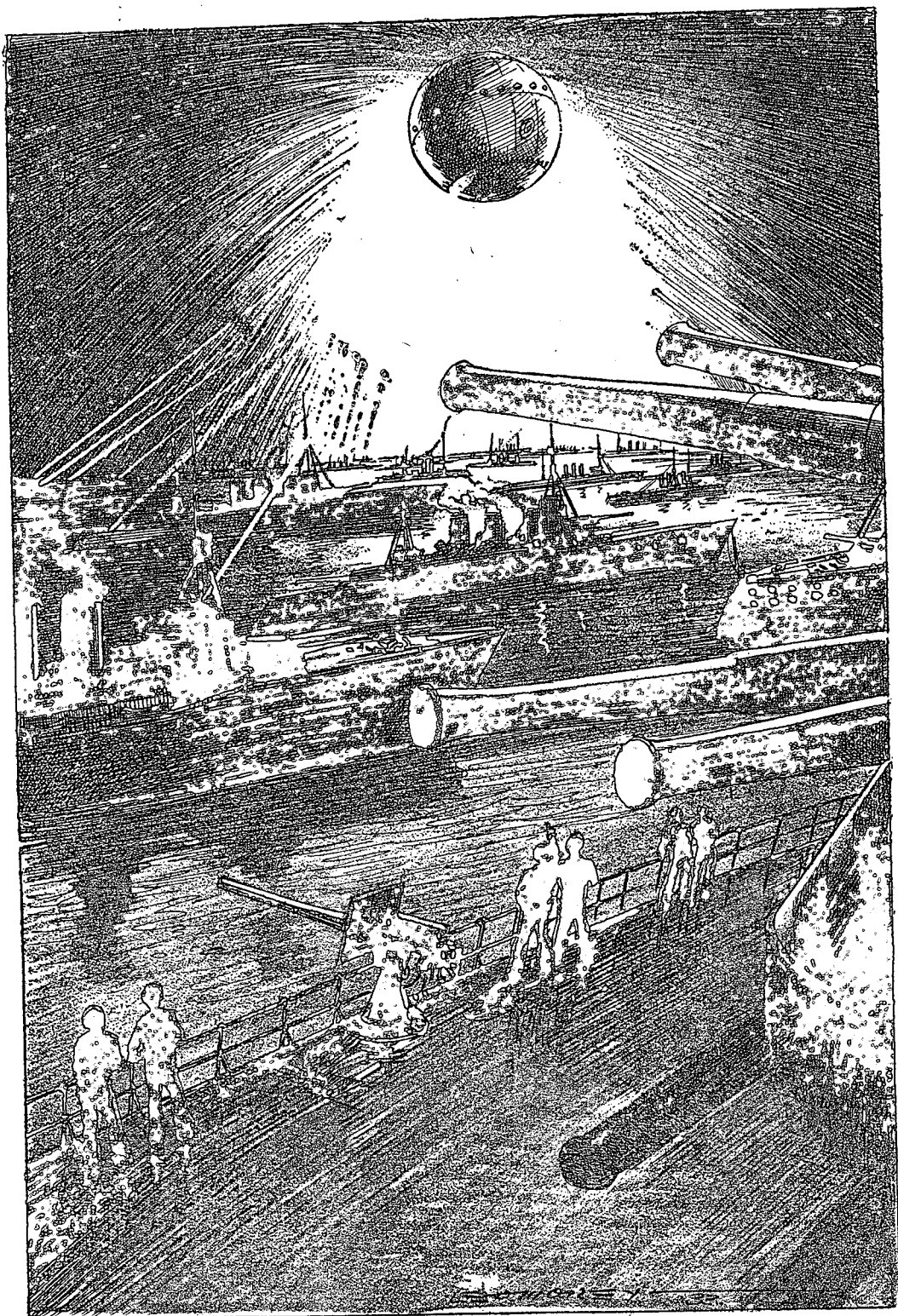
pose, to forever lounge in this walnut, chromium-plated office. Exquisite and superb may describe it deservedly, but it makes me sick! I want to really do things. Now that the atomic power development has progressed from the experimental stage, and our efficiency of beam transmission is so good that, if we made it any better, we'd have to pay the people to use the service instead of getting three cents a ton per thousand miles, and everything runs like clockwork and probably always will, I don't want to hang around here. My salary, as well as yours and Kroelich's, would keep us in luxury all of our lives if we took but one week of it a year. Have you fellows atrophied, or something?"

"Well, where to? The moon for instance?" was Pearson's answer.

"Sure, anywhere suits me. Only let's do something, or I'll burst into tiny fragments before so very long! Lele's been telling me that I should find the fountain of youth or something to improve my disposition. I've been just rotting here for years."

Kroelich, our former radio engineering instructor, chuckled now and then in his corner of the office, his feet on his desk, a desk that must have cost a thousand dollars if it cost one.

"Yes, you are as bad as the rest of them," I told him. "If everyone in this



The terrific onslaught of beams from the invaders threw up the whitest sheet of flame from our screen that I had ever witnessed. It seemed that the screen could never hold, but it did.

outfit did as little as we, there would not be anything to stand on!"

"Now, Bell, we're just paying for being the world's luckiest men, that's all. You know, if there were anything to be done, we'd be tickled to do it with you. Transportation is so blamed fast now, instantaneous in fact, that a trip anywhere wouldn't be any fun at all." The easy-going answer demonstrated perfectly that Kroelich would just as soon never leave his comfortable, padded chair, even to eat, if it had not been for the appearance of doing such a thing. "Of course, if our president wants us to think of something for him to do, we shall most certainly go into conference and oblige him!"

"Rats to the whole bunch of you, and I'll include myself to save any hard feelings. Call Krinsti, Obert and Waller in here immediately, Calloway. Tell them to drop everything!"

"Now something will happen. With all of those ponderous brains in one room, there is no room for me!" With this remark, Pearson rose to saunter off, but I asked all to stay.

"We might as well branch out a bit. Why not be of some real benefit to humanity in addition to owning everything they have? It is our moral obligation."

"They have more now than is good for them!" This answer from Pearson.

A BUZZER broke the silence as we awaited the three scientists, considered the foremost of the day in the fields of electrical and physical research. With unlimited money at their disposal, there was hardly anything, once conceived and established, they could not do. They were truly geniuses.

"Dean Harvey!" exclaimed Kroelich.

At the mention of that name all of our faces lighted up. In came a small man, typical of his breed, quiet, unassuming, but one whose word and judgment you would never even think of questioning.

"How is the Harvey Cancer Institute progressing?" I asked.

"Fine, Bell. Fine, indeed!" was the answer. We loved the old fellow and his quaint ways. "You know, we almost lost an old man last week, but I think he will pull through. Been getting a better serum, too, the last few weeks. Not that we need it any better, but it saves time. In six years we haven't lost a case, and, I'll tell you, we used to get some mighty nasty ones at the start. Now, of course, the monthly examination required of everyone makes it easy. And how is 'Beam Transmission' faring? Well, as usual and must say deservedly. My, my! Think of the perfect cities you fellows have built, spick and span. What a change in so few years!"

"Save the compliments, Dean," I said. "You have done more by ridding the world of its worst scourge than we can ever do. Did you get that billion dollars we transferred to your research account this morning?"

"Ah, yes, yes!" was the Dean's answer. "That is why I came over to see you. I, that is, we cannot accept it, you see. It is such a vast sum of money, and we have enough already!"

"Enough, like fun!" said Pearson. "Ninety per cent of your work is charity."

"True, my boy, but mine is not a business institution such as yours. I cannot turn anyone in need from the Institute."

"How have your bone-growing experiments been coming along?" I asked, knowing what the answer would be. "And the problems of retina

replacement, and revival a day after death, and all of those things you were talking about years ago?"

"Well, Bell, that work all takes time and patience, you know. It cannot be done in a day."

"Have you started on any of them?"

"Well, in an indefinite sort of way, perhaps."

"Is lack of money any obstacle in your path?"

"Not exactly. You see my staff—"

"You really want to benefit mankind, don't you, Dean?"

"Of course, of course!"

"And if you had the money, your staff could be enlarged, and you could work on all of these new ideas of yours simultaneously?"

There was no answer to this as the Dean's eyes remained studying the pattern of the rug upon the office floor.

"We have humanitarian ideas too. We have cleaned up everything in this country and are working abroad, but, to tell you the truth, we cannot spend money fast enough. There is too much of it. That is why we figured the most good we could do was through you. We shan't take 'no' for an answer, will we, fellows?"

Pearson and Kroelich shook their heads solemnly. Since we had learned to talk in billions, they thought nothing of giving away a billion, though I remembered several instances, and I know Pearson did too, when a dollar some years back had been bigger to us than the billion we were giving to the Dean.

"Sorry, Dean, we can't be refused!"

"Of course, I could use a few thousand, boys, but a billion dollars staggers the imagination. I could not believe my eyes when I saw it."

"The more money you have, the more good you can do, Dean," said Pearson as we escorted the old man from the office in spite of his protests. "And there is more where that came from, too!" we reminded him.

"That tickled me," said Pearson after we had re-entered the office. "He'll worry about how to start spending it for a week, and I'll bet at first he spends it a thousand at a time. And the old boy will do more good with that billion than we with the ten billion we are spending for reclamation and all of the rest of the plans. I see your brain-trust is here!"

CALLOWAY had just entered with the three men, Krinsti, Obert and Waller.

"Be seated, gentlemen," I said as I stood before the group of six. "Waller, you said something about a year ago which has been in the back of my head for the past few weeks particularly, but in general, since the very day you mentioned it. Pearson and Calloway weren't there, but Kroelich was. The idea was to project, if possible, a conducting path to some of the nearer planets for purposes of communication. It is the best means of getting outside the Heaviside Layer, and the only means of transmitting large amounts of power. And I don't want to stop there! Rocket ships have been tried. Some were successful in a couple of flights, but only between points on the earth. For anything in the shape of a space-ship to leave the earth, the initial acceleration to get out of the pull of gravity by circling the earth in an ever-increasing spiral course so that the acceleration would not be harmful, would require too long a time to build up as well as more fuel than could be carried. In a straight course, no living being could survive

the necessary acceleration. Even atomic power does not eliminate the acceleration effects. So, you three men will work on the problems of projecting a conducting beam to any desired planetary point. After this has taken shape and the formulas are developed, the space-ship will be next on the program. This ship will be propelled by a force beam traveling coincident with the conducting beam and will neutralize the earth's attraction."

As if I had but given them a routine testing problem, all three men left the office when I had finished, never doubting their abilities. "Can't" was a word entirely foreign to them with the equipment and resources at their disposal. These three men had made possible world-wide television, beam transmission for freight, express and personal transportation, and they had paved the way for atomic power.

A few motor cars and planes still plied the surface of the earth and the sky, but these were only for pleasure purposes. Cities were no longer dusty, grimy and smoky. The air had an invigorating freshness formerly found only in rural districts. This was indeed a new day and age for all of mankind. Development had been most rapid in America, but now the world was feeling the movement, even to its furthest corners.

I could see a look of interest, which had been missing for many months, even for years, in Pearson's eyes. "So that's the story, Bell! Perhaps there is something left to do on this world after all, or should I say, universe? Aren't you content with owning this globe without bothering our heavenly neighbors?"

"Won't you ever quit that line of chatter?" I answered. "Can I help it if you made me the president of this outfit six years ago, when I was help-

less? I wish one of you fellows had been last from Sar and had been cracked up, so that the rest of us could foist this job on you!"

I did not really mean all this, but it was my only defense against Pearson who, good naturedly enough, forever kept putting the thing up to me in his banter which, at times, seemed never ending. Being president did not mean so much after all, for the others had just as much to say in the management of affairs as I had, and all of us had more money than we could ever spend.

"The whole idea is this," I continued. "What will the millions do who are gradually being replaced by machines, now that atomic power is beginning to supplant and replace all other methods of conversion? Why not do a little investigating to open new fields?"

"I don't know what you are going to find, but it sounds interesting enough," commented Kroelich. "At least, we'll be better off if we can drop this useless Pearson on Mars, without a return ticket!"

"Go ahead, you two. I suppose the world would be better off if I weren't around. I sometimes feel that way myself, but I am morally obligated to sign the some odd thousands of checks of our staff, and I don't think you could get anyone at my salary, even, to do that lot of tedious work every week. I'm going to have a rubber stamp made of my signature, and let a clerk do the work hereafter, and I'll just stay home!"

"Well, Pearson, aside from all of the joking, wouldn't you like to do a little visiting in space, outside of our little trip of a few feet, which, six years ago, led to all of this? It has been thought of for centuries, no-doubt, but no one so far has had the advantage

of resources and atomic power which we have. I don't suppose we can do it, but why not try? The experimenting and research will be interesting."

"If it weren't for what we went through so long ago, I'd say that even such thoughts were figments of a fast-failing mind. But in the light of our experiences, which seem like a dream to me now, it might do to try. I suppose your conducting beam will enable you to get signals through to and from the other planets if there are things on them with sense enough to understand what it is all about?" Pearson really seemed to be favoring the idea.

KROELICH had begun to do some figuring on a pad before him. He looked up after a short time.

"Really, the thing does not present such great difficulties. A modification of our present system should do the trick. But I am a bit worried about dissipating so much power at the source. Rough calculations mean some seven billion horsepower at our transmission point. That is, roughly speaking, to cover the distance to Mars, allowing our accepted constants. About 400 pounds of silicon dioxide a second. And with our efficiency, it means six billion horsepower in heat to get rid of. Oh, boy! Think of that, and it will keep you warm for several winters just considering its elimination! I see where we go to some new liquid gas for a cooling medium. Running a thing like that for any length of time will change the climate on this earth! Not a bad idea when those ice caps begin their next predicted descent from the poles."

Pearson was standing over Kroelich. "Say, where do you get that power figure just for a beam for a signal path?"

Whereupon argument followed argument for some minutes. It was

discovered that Kroelich had made an error in one of his constants, and the power figure was reduced to less than a million horsepower.

"Kroelich, what would I need to project a thousand ton space-ship at a constant acceleration of five miles per hour per second? That is roughly an acceleration of 7.3 feet per second per second. If we figure half of the elapsed time for accelerating and half for decelerating, it would take about one hundred hours for the trip to Mars. Hmmm. The maximum velocity attained would be, whew! 900,000 miles an hour. If such a space-ship ever hit anything! Let me check it back to make sure. Yes, that's right. We could perhaps stand an acceleration of ten feet per second per second without undue strain on the human body. But, anyway, one hundred hours is less than five days for a trip to Mars!" With this I laid aside my slide-rule and began contemplating what the real thing would mean, if it could be done, of course.

"No trip at all to the moon at that rate, Bell," said Pearson as we awaited Kroelich's figures on the required power for the space-ship to traverse the distance to Mars.

"Well, let's see. It won't take but a moment to get the rough figures. Only eight hours for the trip, and the maximum velocity would be only 72,000 miles an hour. A pleasant night's trip. I suppose we could build a receiver and transmitter on the moon for beam transmission, but I shouldn't care to take the trip personally. I can't help but remember the chances we took on that one journey six years ago. What fools we really were, and all of our present success is but fools' luck, really!"

"Right back at the seven billion horsepower figure, boys, and this time

"I made no mistakes," said Kroelich, interrupting our conversation. "It is still a problem, but we'll do it if it can be done. Say, it isn't so bad to design a ship to withstand external pressures, but in this case we'll have the problem of withstanding internal pressure. A sphere represents the strongest form for weight for the former, but what sort of a looking thing will we have for this outfit? Hold on! We have only fourteen pounds per square inch, which won't cause us any trouble. The heat insulation will be the real trouble. The radiation will be terrific with such a steep temperature gradient between inside and outside."

"Well, what a day this turned out to be!" said Pearson as he shook his head and whistled. "But if I can find a lovely lady on Mars for a mate, as you did on Sar, Bell, I'm all for it. The sooner the better for me!"

"I'll relay the compliment to Lele, Pearson," I replied.

"Come along to the transmitter, Bell!"

"No, I'm taking my ship tonight," I said. "I feel just like the spin!"

"Fine advertisement you are for Beam Transmission, Inc., if you never use it for personal travel."

"Good night, fellows!" I said as they entered the transmission chambers and were whisked instantly to their destinations without even a sense of motion.

I took the elevator to the roof, some two thousand feet above the pavements below. The sky was ablaze with the lights of the metropolis this December evening. The air from the Lake was cold and penetrating. The attendant maneuvered my gyrocopter to the edge of the roof, whereupon I entered the heated cabin. In a moment I was soaring far above the lights and moving swiftly westward.

MILES later I gazed up through the glass dome of the cabin at the brilliant splotches of light above in the black velvet of the heavens. Some planets, but for the most part, they were suns, bigger than our own, with planets most likely inhabited by reasoning beings, perhaps billions of years advanced from us. What a glorious undertaking to attempt to really solve some of the wonders, if only in our own little system. Writers, years before and even now, were painting fantastic but inviting pictures of our planetary neighbors. Would the time come when they would no longer be writing fiction but modern history instead?

I was determined to make the attempt at least, dangerous though it would prove to be. Once before the four of us had been on a strange world, tiny to be sure, measured by our standards, an electron, no doubt, but vast to us then as our own world. If Mars were inhabitable, a receiver and transmitter could be set up there, assuming that minerals and products valuable to us existed. I hardly formed an idea of what the inhabitants might look like or what their civilization might be like. The existence of life had been proven almost beyond a doubt. Air, similar to ours, surrounded this old red planet too. But out of our own system might life not exist in a different atmosphere? Could not a reasoning being have a different method of metabolism and still be alive? Why must all flesh and blood be alike in the endless infinity of planets?

These things were still whirling about in my brain when I landed in the courtyard of my home. Lele, wreathed in smiles as usual, greeted me lovingly.

"Bell!" she exclaimed, "you are a

changed man tonight. You are actually using your head again instead of letting it remain useless! Tell me what you are going to do now. It must be something really wonderful?"

Such child-like eagerness! One could not withstand her begging for very long. I had tried it many times before but had always failed. At the dinner table I unfolded to her eager ears the afternoon's discussion. It was vague, of course, for the practical benefits were yet to be discovered, but it would mark, were it successful, the opening of a new epoch on the face of the earth. I knew, however, that Lele would be a pest from that time on, for she loved nothing quite so much as using her imagination, and this certainly was an opportunity. Every day I was to hear her ever-changing ideas on the physical appearance of Martians, one day large and black, the next, small and white. I told her that we'd know for sure some day and not to bother wondering about it, but that did not stop her at all. After she ran out of ideas on what the intelligent inhabitants looked like, she started on domestic animals, then vegetation and even scenery.

And yet, with all of her imaginings, she had a very practical mind, trained to precision and accuracy for years in the laboratories of the Sarians under the direction of the superintelligent creatures called Fyns. She had retained enough of her technical training to give us fundamentals for the rays used in her land and protective ion screens to repel them and render them harmless. We were able to reproduce them through this aid, but the applications of rays were limited to very large excavation projects and the like. Wars were now a thing of the past unless Beam Transmission, Inc. did the warring. There would be no

fighting between nations because the rules had been laid down by us, and, with no means of transportation, there could be no war. The world was enjoying a new era, though we knew very well that more than a few years would be necessary to wipe out inherent race-hatreds and jealousies. We would never see that time, I was sure, but it would come.

Although the three scientists encountered many vexing problems, the day finally arrived when they had made enough progress to inform us that a project of the kind was practicable. They had checked with Kroelich on the ray generator. We now had merely the practical application to attend to. The spot for the transmitter was purchased. We picked worthless desert to serve the purpose, since inaccessibility no longer was a known term on the earth.

Before long the walls were complete and air-conditioning units installed, as they were in all buildings and homes. A transmitter and receiver were set up first, since all materials and men could be transported instantly, and the working time was cut to an unbelievably short number of days. The cooling medium for the generator would be liquid carbon dioxide, as in the usual high-powered unit installations. The fuel could be easily obtained from the surrounding desert. Though aluminum base fuels, such as clay, resulted in higher efficiencies, we had enough sand to do us for a million years if necessary, just for the taking.

IN exactly four months from the starting, we were standing in the insulated control room above the transmitter which was located in a great well two hundred feet across and a hundred feet deep. The installation, really a simple one, was the neatest

my eyes had ever beheld. The shining anode was polished to a perfect mirror finish, and shone like a white-hot piece of metal in the brilliant lighting of the metal-lined cylinder. The singing of the idling atomic generator, five units in all, was audible faintly as last minute checks were being made by the special operating staff, made up of picked men, highly skilled, and under the direction of the three scientists. Tests could be made for only a few moments, seventy minutes at the most, because of the small arc which could be covered by the rotation of the transmitter. But a series of night transmissions should, after a time, result in a response from Mars, if there were intelligent beings living on it.

A radio transmitter of very great range and power was waiting to send its message over the beam to the planet some 40,000,000 miles away. An observatory, too, had been built connecting to the transmitter building. We were awaiting the signal to begin our broadcast. The beam would cover approximately half of the area of Mars turned toward us. We were a bit in doubt as to what corrections to make for curvature of the beam. In fact, it would be perfectly possible to miss such a small mark at so great a distance. Yet, we could not widen the beam too much, because of the decreased conductance on the surface of Mars. Were there a great deal of moisture present in its atmosphere, our transmitter would be lacking in power to penetrate the veil, unless the beam were narrowed very considerably. In this case, our chances of missing the planet entirely would certainly increase manifold. We were simply making the first check, hoping that the figures of lifelong astronomers and mathematicians were sufficiently

accurate and reliable to give us a good chance of getting our beam through to Mars. The beam would be conducting, both ways, of course, enabling Martians to signal us. We had no idea of what to expect in the line of a signal than they knew what we should send, were they aware that transmissions were to take place to them. A gong suddenly sounded.

"One minute to go! Make ready!" shouted some one from below. The words echoed and re-echoed in the well. "All inside insulating chambers!"

The silence was broken only by the steady hum of the battery of generators. We were breathless ourselves, with no words on our tongues. What could be said, as only seconds remained before an event which might alter future history entirely? Would the cooling system handle the great dissipation? Could we possibly hit so small a target at so great a distance? These and many thoughts raced through my brain as the seconds seemed to drag by. Mars would soon be in position.

"Time!" whispered Pearson at my side.

We watched the indicators closely. A tremor was becoming very noticeable.

"The beam is on!" shouted Kroelich, bringing us all out of our stupors. "Look at that power rise—wow!"

We had all seen such figures before in our central stations, but now they took on a special significance. All of this power was merely throwing a conducting beam for millions of miles out into space, and all we could see was a misty ionization of the air within the generator well.

"Operator! Send the code message," I said to the man at the radio transmitter controls at my side. "Repeat for each frequency range until you

reach twenty-five megacycles. Receiver man! Follow the bands and get your reflection of signals. Tell me when you have your first reflection. Calloway, you vary the angle over the established limits!"

IT would take a little less than seven minutes for a signal reflected from Mars to come back to us from the surface of the planet at its present distance. This reflected signal would be necessary to know when we hit our target. From the investigator's point of view, this alone would mean the changing of theories to laws, for the curvature of a beam in space could be definitely determined. This would be invaluable to our future transmission experiments when we could calculate with exactness the angular error due to beam curvature in space due to the sun and other bodies. Many years before radio reflections had been received from the moon but from no greater distance, due to attenuation. These cases were considered more or less as accidents at the time.

"Cooling system is holding up all right, but it certainly is handling a healthy load," said Pearson, as we intently watched the man at the transmitter. "Now we are dissipating half a million kilowatts into thin air, or I should say, space."

"Quit your chatter, Pearson," exclaimed Kroelich good-naturedly. "Can't you see we are trying to hear something?"

"Reflection!" shouted the receiver man. "Something wrong, because the distance is only 11,000,000 miles, sir!"

"Hold it there," I said to Calloway. "Transmitter man, send out your dashes again."

One hundred eighteen seconds for reflection. It was impossible to change the velocity of the signal, certainly.

"Observatory calling, Mr. Bell!"

"All right. Hello, Carter? What? Are you positive? Be right over!" With that, I shouted to Kroelich and Pearson, "We've hit with our transmission as an asteroid or space-ship or something. Hustle! We'll get a look at it."

A mixture of emotions swept through me, but, by the time I had reached the telescope-screen, I had made up my mind that it was merely a small planetoid in the beam.

A single look told us little. There was an object, but it was such a mere speck that nothing could be definitely determined. It did shine at times, or seemed to.

"That is maximum usable amplification tonight, gentlemen," said the astronomer. "That 'air' is a bit bad, undoubtedly due to the amount of heat being radiated by the generators."

"Call Thibault immediately!"

"He is calling now, but he cannot make out much more than we can," reported an attendant who had just come in from the phone. "The earth seems to be in a direct line with its course, however!"

Obviously, there was no thought of sleep that night. Although we were all agreed that the possibility of a space-ship on its way to the earth was most remote, I knew that all of us could not throw that possibility from our minds. As the hours passed, the object became more plainly visible. With the approach of dawn, I called Lele and told her we were going to the other side of the world for observation purposes. More I did not tell her, or she surely would have gotten there as soon as we did. The observatories on the other hemisphere were hardly comparable with ours, but with the

approach of the object, their shortcomings would be less noticeable.

"Call Cook and tell him we'll be right over," I said. "All set?"

"Surest thing you know," replied Pearson. "Looks as if you and your ideas have started something. That object would not be visible if it were not for radiations in the light spectrum caused by the transmitter beam. And that would happen only with metal. If it isn't a space-ship, it must be one big piece of metal in an uncombined, in its native state!"

Although I made no answer as we stepped into the beam-transmitter chamber, I agreed with him. That made the space-ship theory more plausible. Was it directed at the earth? Where did it come from? What would the occupants look like, and would they be hostile?

"Carter, call the generator station and tell them to hold the conducting beam as it is, until we call back. They can keep it only a few minutes longer now."

With that, we closed the door, and in an imperceptible interval were whisked half-way around the world. Cook, the astronomer in charge of the observatory was waiting for us in the receiver room.

"Are you in touch with Thibault and Carter?" I asked.

"They are both on the wire, Mr. Bell. Our reflector is being trained for the position of the object as soon as it comes around to us. It won't be many hours, now."

We sat in the office, saying little and wondering a great deal as the sun set in the western sky. We did not think of the marvel which had permitted us to see the sun almost rising on our side of the world and about to set where we now were, all accomplished in the twinkling of an eye! Those min-

utes until the object would come into view were the longest I had ever spent up to that moment. Pearson smoked one cigarette after the other. Kroelich paced the floor nervously, while I sat quietly, looking at things with eyes that did not see. For some reason or other, if this were a space-ship, I was sure that it was not on a friendly mission! Why I thought this, I do not know. I should have been anxiously awaiting its arrival if it were earth-bound, for it would be the first event of its kind. Instead, I was worried and sick at heart.

THE long-awaited night was descending. We arose from our chairs and walked to the observatory dome. Images were average that evening. It should be possible then to pick up the visitor if any reflections from the sun and from it could be seen. It had long since passed from the range of the beam on the other side of the earth.

"We have it, gentlemen," said Cook as we stood above the black screen. "I have gotten in touch with Bouche to attempt to determine its velocity, path and size. We hope that, before the night is over, we can give you these figures within some degree of accuracy. In the meantime, all we can do is watch. You'll excuse me if I leave you for these purposes?"

We nodded assent, and for the next few hours watched the screen before us most intently. The object was not as yet sufficiently close to make out at all clearly.

"To keep a course like that, it must be under some sort of direction all right," mused Kroelich. "It certainly is not in an orbit around the sun. It's a space-ship as sure as I am a foot high!"

Yes, it certainly was. There was no

doubt about it now, though none of us had ever seen one. The report, as dawn approached, was that it was nine million miles distant, traveling at a constant velocity of 170,000 miles an hour. From the calculations we had made for our space-ship, this was relatively slow, but she might be merely cruising at that speed. Her course was directed at the earth. Her size was almost a thousand feet in diameter, her shape being spherical. No signals, which could have originated from this ship, had yet been picked up.

"Well, fellows, I'm almost dead, and there is nothing we can do about it but wait," I said as the sun was dispelling the black of night with a faint glow in the east above the mountain tops. "I could sleep for a week the way I feel now! Let's go home and have the transmitter kept on this fellow and the signals along the beam kept up. There isn't a thing more to be done. If they want to land, we can't do a thing to stop them, but we can hope for the best. I don't know why I consider them to be enemies because they probably are on a friendly trip of exploration. It will be some little time before they reach us if they keep on at this rate!"

Lele was very much excited over the news, and never once considered the angle of danger I had. She felt sure that the visit would be a friendly one and started off on her imaginings as to the probable physical appearances of the space navigators. I heard little of her ideas that night, however, for I was exhausted and fell into a deep slumber immediately.

This was not to last, I found, for, after two hours, a frantic call from the beam station aroused me. The station had been suddenly put out of operation and the battery of generators badly wrecked! Almost before my eyes

were open fully after my short slumber, I was transferred to the new station. Lele had come beside me, and in a very short time, Kroelich and Pearson appeared on the scene of the disaster.

No one had been badly hurt, but the power units were hopelessly ruined. I demanded a complete and concise report of what had happened. Everyone agreed on the story to the smallest details, so that I took it as it was given by the chief attendant. Shortly after the ship had come within the beam of the transmitter, signaling was begun. Almost immediately, sharp rasps were heard in the receiver in the neighborhood of ten megacycles. Following these notes, there was a violent tremor in the station, a severe jar and a great display of flames and coruscations within the shaft, and for miles out into space. Then the generators gave out. Indicators on the board were bent and burned out, indicating that a tremendous instantaneous overload had wrecked the system. It must have been too sudden for the circuit breakers and safety devices to function. The observatory reported that the space-ship was now practically stationary in position.

This was indeed a pretty mess! Unquestionably, the ship had been directly responsible for the wreckage. That meant too that they had a goodly supply of powerful destructive energy, and they used it almost playfully. Certainly they had no idea what work had been going on. Just for the fun of it, as it were, they had put a million dollars worth of equipment out of commission! And, since they were earth-bound, they probably would continue their destruction to show off their prowess. We could never hope to build up defensive and offen-

sive weapons in time to meet them equally.

For two days the space-ship remained more or less stationary in the heavens, apparently awaiting another beam from the earth, but none came. Work was begun, however, and in two weeks the station would be able once more to operate. I believe that every one of us breathed a sigh of relief when, after the two days, the vandal started off on another course, this time at a much higher velocity, sometimes exceeding a million miles an hour under prodigious accelerations. In two weeks she could no longer be made out in the heavens.

THE protective devices at the new beam station were made far more sensitive than they had been before. Every precaution was taken to prevent a repetition of our first experience. We were all outspoken in our fears of what might transpire if the marauder saw fit to return to the earth again, especially if she chose to make a landing and look about a bit. In no time at all, everything would be ruins and chaos if the vandals chose to eliminate the present inhabitants of the world.

Once more the attempts at communication with Mars were begun, and this time they were not interrupted. After three nights, the planet gave back a reflection of our signal, and, three nights after this, signals were received from Mars, both voice and code. We rather expected to hear voice frequencies similar to our own, since conditions were so much alike on the earth and her near by neighbor. They did extend to higher frequencies, with fewer lower frequencies, but not above the range of the ordinary human ear. Since these sounds did not resemble the sharp

rasps we had received in our first tests, and which we had thought came from the space-ship, we were certain that the origin of this space-ship was not Mars, or at least not from the same portion with which we were now in communication.

It was now merely a matter of establishing a common language, a thing not easily done. While these things were being evolved, our minds were forever being haunted with memories of the space-ship. What if she were not alone, but merely an advance scout for a great air fleet, or rather ether fleet, to which she might have returned with the news of the beam from the earth!

"Something must be done and done at once if we expect to at least feel safe from now on. We have seen our first space-ship, and it will not be our last, or, it may be if we are eradicated from the face of the earth by one or some of them. Exploration of the heavens has reached our solar system. It probably has gone on forever since time began, but we have not known it nor have we anticipated it." Dean Harvey hesitated as he viewed our haggard and worn-looking faces. We were in a serious predicament, and we knew it. "We, as exalted mortals, have never thought that space would be conquered unless we conquered it. Time is endless, the universe is infinite. There is no yardstick by which to measure either. Hence, I can say without fear of contradiction that intelligent beings have always traversed space and always shall! Possibly the earth has been visited before, millions of years ago, but we know nothing of such happenings. Our well-being today resulted from what we learned on an electron in an atom in a molecule of a brick in a wall. We are all positive of that now. Our jour-

ney to Sar was only a matter of feet. As I see it, and I know you gentlemen will too, our future well-being and safety may be said to have resulted from that same journey. We must wall the earth with protective screens even as the Sarians and Poruvians did. We must build giant engines of destruction to combat outsiders who come with destruction foremost in their minds!

"As a digression, perhaps space-ships saw even the lands of Poru and Sar, space-ships, microcosmic, plying between electrons in materials visible as solids before our very eyes. And in the macrocosmos of which our earth is but an electron, space-ships no doubt travel. There is no end in either direction. That must be our present picture of the term, infinite!"

Such a discourse from the Dean was unusual in only one respect. We were startled by the declaration of war against space-marauders from such a quiet, peace-loving old man. At the time, however, it did not seem so very much out of place, since we had a serious problem to face, so serious in fact, for the very existence of the earth at that moment probably depended on the five of us! We did not think of the glory, nor did we think in terms of the tribute we could exact for saving the earth. We were merely doing what we knew must be done, without thoughts of reward. The recompense would be our continued existence, the saving of billions of lives, and the saving of the greatest industrial combination ever to exist upon the face of the earth. There was none else to do it; the job was ours!

The governments of the world were with us as a unit. No petty arguments now. The world was united in a single prayer that we be in time. Years

would be required to build up any sort of defense which would stand the onslaughts of ships with the power possessed by our single visitor.

Ever hopeful, the job was begun. Disgusted as we had been at the terrible destructiveness of the weapons we were about to build, we were thankful now for their terrible effectiveness.

THOUGH a constant watch was maintained at all observatories on the earth, no sign of the space-ship was reported. As weeks grew into months, some measure of reassurance came back to all of us. We might never again in our lives see another, but we had not forgotten our first impression, and no time was being lost in building up the defensive and offensive weapons. The task was gigantic. The rough area of land and sea to be covered represented about 200,000,000 square miles. The trillions of horse power necessary to maintain an effective screen over such an area staggered our minds.

We were undaunted, however, thanking our Maker that we had atomic power at our disposal. Without it, we could not have begun. Even this tremendous amount of available energy would not prevent access to the earth's surface, if the screen were attacked heavily at too many points. It could be concentrated at almost any number of points, leaving it quite ineffective between them, and, the greater the number of concentration points, naturally the less the energy available at any given point. Our plan was to build the complete system first, and, if time permitted, to continue to add power stations to increase the effectiveness of the screen.

Giant cutting-ray projectors worked as they had never before, excavating

for the monstrous power station foundations in the polar regions, in deserts, in tropical jungles, in temperate waste-lands. There was no let-up, and, as the work progressed, our fears diminished. We had thought our central station installations of the year before, a billion horsepower in a single station, had been an achievement, but these were dwarfed in comparing them with the stations being built for the protective screen. Twenty of these super-stations would be necessary for one screen projector, twenty of which were being built as the first project. Many others would be required for the destructive rays. As for different special rays, no need had arisen for them after our first acquaintance with them on Sar, but such projectors were being constructed now, and in vast numbers. The world had turned mad in its thoughts of preservation, and hardly a man was not working on defensive or offensive weapons. This necessitated the perfection of concentrated synthetic foods, since none remained to till the soil, even though machinery had replaced human labor to a very large extent.

At times I sat in the office or at home with Lele, looking upon all this feverish activity with a detached mind. How laughable it seemed then to look upon the world swarming with little things called men striving insanely to preserve their precious lives. And all that had happened was the sighting of a space-ship, their first space-ship, which had almost frivolously damaged a conducting beam transmitter. Perhaps it had been done only in curiosity!

But the sight of Lele and thoughts of her always brought me back to normal, and now I was one man, with the rest of them, fighting for her life,

and I was the inspired leader of all of them. Work never progressed rapidly enough, nor could enough power be dissipated from a single unit atomic converter.

It would be wrong to say that all of our time was spent in directing this wave of preparedness. The five of us, once the work was well under way, did little to further it outside of supervision. Our staff was entirely capable, and I had no fears that the final outcome would be anything but as near perfection as possible. It seemed an epoch-making era, for we had established communication with a planetary neighbor and had been visited by our first extra-terrestrial visitor.

A second and a third conducting beam transmitter were rapidly nearing completion to maintain a more nearly continuous conversation with our neighbors. Ground was being broken for eighteen more as well, and pilings built in the seas where necessary. Outside of a few lessons in mathematics, our exchange of ideas had not progressed so very well. It can well be imagined what the difficulties were inherent in the scheme of establishing intelligible communication with an unknown race on a distant planet!

We were hurrying the completion of our space-ship to be sent along the beam to Mars. It was our only hope of ever establishing relations with our neighbors. This ship had been pronounced practical after the first survey of the problem months before. Our only fears and concerns were over the problem of the natural missiles of space, meteors. We hoped that the screens and detectors could be made sensitive to their approach, and their deflection or ours accomplished in time to avert catastrophe.

Our ship was not an impressively large affair, but we felt that she would serve her purpose. She was a long torpedo-shaped cylinder, twenty feet in diameter and one hundred and fifty feet in length. While this, in truth, was not a space-ship in the full sense of the word, it could be called such by virtue of its space-traversing ability *via* the conductor beam. It could not navigate space because it had no means of propulsion other than rays which were effective only over distances of a few thousand miles. The repulsive rays and attractive rays lost their energy rapidly in space. The calculated energy required to overcome gravitational pull, if supplied from the ship, would be almost an impossibility, and there was no need for it as long as we could supply this energy from an earth-station and be pushed along by the force superimposed on the conductor beam. The net result was the same, but the ship design was simplified a thousand times, and the power plant necessary only for maneuvering over the face of a planet, a dwarf compared to the plant of the earth beam-station.

WE often mentioned the huge units which must have been contained in the enemy space-ship, which would permit it to go about free in space from a planet and come near another attracting planetary body and neutralize its attraction. The power which had wrecked our first transmitter was but a drop in the bucket. The Dean suggested that they drew their energy from space radiations and merely controlling them, rather than converting them from matter aboard the ship. We knew relatively little of the radiations of outer space, and had hoped, when our idea had first been conceived, to find

out more about them than the previous stratosphere flights had shown some years before our time.

Although continuous communication had been maintained for many months with the Martians, very little progress had been made and very little learned. The day arrived when our space-ship was ready for its projected flight or "glide" to our ruddy neighbor in space. The distance separating her from the earth had increased quite a bit from the time we first made contact, but the trip would take only one hundred and ten hours at the most, at an acceleration of 7.3 feet per second. Anything greater would be too uncomfortable, and there was no need for any great discomfort in making the first trip. I anticipated long beforehand that which did come up on the eve of our departure. Lele would do nothing but go along, so there was nothing I could do about it. I had a peculiar feeling, selfish, of course, that, if anything did happen, I wanted her with me. So, I was not as unhappy about the outcome as I pretended to be.

Calloway would remain behind to give us any news, and we, in turn, would give him plenty of it if we reached our destination as we knew we should. All calculations had been checked, and it was no worse than the first attempt we had made in visiting another inhabited body seven years before. In fact, it was less hazardous in every way we could think of. This time we knew where we were going, we knew the method. Only we did not know what we would find. At least we hoped for an intelligent race with gentler emotions within them, than those which our first extra-terrestrial visitors had possessed.

Hours never passed so rapidly as they did that night. Something with-

in me seemed to hope that the time would not pass, that something would go wrong. It was quite an undertaking, to be sure, but, I argued with myself, nothing would go wrong. It was to be a stupendous adventure, undreamed of, almost unthought of in simplicity of accomplishment.

We were aboard the ship. Everything had been checked and rechecked. There could be no question as to perfect results. Picked men were at the controls aboard ship and at the transmitter stations. Two minutes to go! We looked at one another rather sheepishly. This *was* quite an undertaking, but, before each other we would not admit fear, though each could read it in the others' eyes.

Lele was the exception. Though she had been my wife for seven of the happiest years of my life, she never outgrew her wonderful child-like simplicity and mannerisms which made me love her more than ever. Now she was sitting, all eagerness to be off on this adventure, as if there were nothing but wonders and delights in store for us. Bless her! Compared with her, we were all cowards. She was not even an earthwoman, and she was displaying more courage than any of us on this trip that I had planned.

"Twenty seconds!"

It would soon begin. I know my heart turned over several times when that voice broke the silence which had descended upon us as each, in his mind, made a picture of what he expected to see and find at the end of this journey into space.

"We're off!"

"Oh, Bell!" cried Lele, her eyes wide with the greatest excitement I had ever seen registered. "Just think, in a few days we'll be on Mars! I'll bet the people are funny looking be-

ings with long legs, round stomachs and big, flappy ears like elephants. But they are nice, kindly people."

We all smiled, glad for the break, and we agreed with her. We did not truthfully feel like arguing one way or the other. The feeling of motion was almost identical with that of riding on the electrically-powered trains which, some years before, had possessed as high accelerations as five or six miles per hour per second, though it was seldom used. The feeling was unpleasant, like a constant push holding one's back to a car seat, or, if one were facing backward as Kroelich and Pearson were, a constant tendency to keep one's back from the seat. It induced slight nausea in all of us after some time, but there was not a thing to do about it but to hope the effect would wear off after a time.

"This journey is somewhat of a risk because one station cannot give us a beam for more than a trifle over an hour. We'll have to depend on the rotation of the earth to bring the next one in range. Even if we are deflected from our course by meteors and asteroids, we shall soon be at a point where the cross-section of the cone sent out by the transmitters will allow us quite a bit of latitude without losing our propelling force. We have rockets for such an emergency, but, of course, they are effective only in free space, and we could not use them for deceleration in landing on a planet," I explained, but I did not talk on because, below us, the earth was undergoing a most spectacular transformation.

THE edges were coming up all around us! This phenomenon of apparent transformation from convexity to concavity was uncanny. Sud-

denly we were aware of a gradual lessening of the backward pressure. We were going out of range of the first transmitter! What if the next one were not in operation? We should be pulled back to earth and dashed to fragments on the ground.

In just a few seconds the uncomfortable feeling had retired in full measure, and I breathed a sigh of relief.

"How far have we gone in that seventy minutes?" I enquired of the man at the board and controls.

"Thirteen thousands miles, sir! Our present velocity is above twenty-one thousand miles an hour!"

Twenty-one thousand miles an hour! That was almost six miles a second. Incredible! I shivered when the meaning of that tremendous velocity dawned upon me as I sat out in space on a mad journey to an unknown planet.

"Rather moving along," commented Pearson. Apparently even his love of adventure had dampened now that we were hurtling along faster than any man had ever traveled, or surely faster than any man had traveled and lived!

The Dean now seemed to be enjoying the trip as much as Lele. At one time, a dying man, we had wondered at his bravery, but his manner this time had not been quite the same. Then he had nothing to lose, but now he was a new man. Apparently he had seen the futility in fear and was beginning to look on this voyage in the light in which the rest of us should have and soon did, because our fears were merely spoiling the greatest adventure ever attempted.

Conversation became more spirited than it had been, as, one after another of the twenty-one transmitters took hold and projected us into space

at a constant velocity. The sky which now extended all about us was a wonder to behold. I do not believe I have ever seen so black a black as that velvet sphere. The myriads of stars, augmented by more and more, invisible from the earth due to the diffusion by the air envelope, stood out so far that it seemed one could almost reach out and touch them. The sun, which at first blotted out much of the view, was withdrawing slowly. It could not be looked at directly without tinted glasses being worn for the actinic rays in free space were deadly.

"Too bad we shan't get a close look at some of our other neighbors, Saturn, for instance," said Kroelich. "What a view that will be when we do see it! Say, the calculations did not allow us as much leeway to that moon of ours, as I wish they did. Look at the thing coming up in size!"

"I know we'll come fairly close, closer than any human being so far has, unless our ancient histories are incomplete, but don't worry about it. We won't even feel the effects of its attraction!" I replied, but Kroelich showed alarm from that time on.

"We should cross the point of maximum influence after we are about five hours out," added Pearson after a short mental calculation. "We'll miss the lady Diana by forty thousand miles, but what a sight from this bird's-eye view we have at our command!"

We were in constant communication with the receiving stations behind us on the earth, but the marvels we beheld made us silent with awe rather than talkative. Calloway asked question after question, but I know the answers disappointed him. He finally kept in touch with the man at the transmitter aboard our ship, ig-

noring us completely after a time. We were content to remain quiet and watch the glories of the sky from our darkened compartment. The moon was truly an awe-inspiring sight as she grew and grew before us. Calloway reported that the station was feeling the sideward drag very perceptibly then. And we still had an hour before the effect would lessen. But still I saw no real reason for worry.

We did sit up and take notice when he reported that the observatory noted that the beam deflection at our position was five hundred miles from the normal. That indicated trouble ahead. The battery of converters was now at full load, attempting to pull the beam back to its normal. The force was becoming more intense, and we still lacked three-quarters of an hour of being in our worst position!

The greatest energy projected was in the direction of the beam, while the force was reduced rapidly as the angle from the transmitter path increased, being quartered at right angles. We had not contemplated any attraction of sufficient magnitude to require much expenditure of power except that required to propel us in a straight line from the earth to Mars.

"No going back now," I said. "It would take seven hours to come to a stop. We must take our only chance."

Lele's brows were puckered a bit at the note of trouble, but, either she did not realize the full truth, or she was extraordinarily brave, for she made no comment except to exclaim at the wonders of the moon's surface as it loomed larger and larger.

"We're in for real trouble!" whispered the Dean as we watched the instrument board. "Calloway reports we are now one thousand miles from

the normal path. Ten minutes will tell the story. Now the acceleration toward the moon is noticeable. Feel it?"

We did, and it brought very unpleasant thoughts to our minds. Would we make it after all? I shuddered at the possibilities before us. Death by collision with the earth's satellite! Death on a vast, barren waste, terribly cold in the shadows, terribly hot in the scorching sunlight without diffusion.

"We're in for it, losing all of the time," said Pearson. "We'll never make it! We are goners, sure!"

"Shut up!" said Kroelich. "Don't be a fool. You'll frighten Lele. What must happen will, but, until it does, don't give up!"

IT certainly looked as if we were lost in the next few minutes as we came within the maximum attraction of the moon. Our deviation to her was increasing rapidly. Our acceleration was as great toward the moon as it had been toward Mars, and the vector we were tracing was surely approaching the moon as its destination.

"Calloway on earth has about gone crazy. Listen to him yell," said Kroelich. "Poor fellow, he feels worse than we do."

"Well, why shouldn't he?" I replied. "We'll soon lose all memory of what is about to happen, but he'll carry the thoughts to his grave!"

Now that the time had come, I was surprised at the calmness of everyone of our group, of the crew, who knew the truth now, and especially of myself. I felt no panic. There was no fear in me as I held Lele close.

With tears in her eyes she said, "Bell, if this is the end, I am going happily. I have you, and I have seen

the moon in full glory, as one destined only to die upon her could see her. It has been worth while!"

There we waited as the space-ship pointed more and more toward the fast-approaching moon. The greatest attraction was present, and we could not withstand the pull of that great body. Inwardly I began feeling a rage after my calmness. What fools we had been to trust the calculations which indicated we would pull past the moon without even noticing her attraction! The generators at the earth's end of our beam were carrying a two hundred and fifty percent load. I could picture the sweltering heat near those units and the seared attendants who were doing their utmost to preserve us from the terrible fate ahead.

The space-ship jerked, but we hardly heeded it. Our minds were already made up for the end. It was the man at the board who still had sense enough left to observe the indicators.

"I don't know if I am wrong or not, but our velocity toward the moon is practically stationary now, sir. It should be increasing with the acceleration!"

The indicator certainly showed that, if it could be depended upon!

"Sir, we are pulling away from the moon. We certainly are!"

Calloway's anxious voice, missing for ten minutes, came back to us. "We've got you again, Bell. In the overlap of the two transmitters you have almost twice the power available as in a single beam. We'll get you back, if we can, before you pass out of the fringe of influence of the transmitter you have been traveling on before this one could cut in to help. You are going to have a rough ride, but it cannot be helped. Hang on!"

Calloway was running the two transmitters at all of the power he could convert to get us out of the moon's influence, after which we once more would have only one transmitter for driving, due to the angular limitations as the earth revolved on its axis. If those ten or fifteen minutes would only be enough! I doubted it, but at least there was a ray of hope now. We clung to it as a drowning man clutches at a straw. We were not beaten after all, though our chances for escape were very slight.

"We might make it, folks." The Dean shook his head as if to make up his mind definitely one way or the other. "I'm going to lie down before I fall down!"

Standing was becoming a difficulty. The acceleration was increasing and the vector was pointing nearer and nearer to our normal path. The indicator crept past eight, past nine and up to ten. After hovering there for awhile, it rose jerkily and hesitatingly to twelve, to fourteen and finally to twenty. Our course vector was crossing the course in a straight line between the earth and Mars! Breathing became a difficulty, and motion exacted a great muscular effort.

"Got to do it!" I heard Calloway shouting. "Got to do it, no matter how much it hurts!"

From the floor I could see by the indicator that he was doing it all right. The acceleration was thirty-five feet per second per second and still slowly mounting. I began to feel oppressively warm, then numb. We were all on the floor because breathing was easier when our bodies were in the line of motion.

How long could Calloway keep it up? I prayed that the time would never come when we should fall back

on the power of one transmitter station. No sooner had I thought of it than it happened. I watched the acceleration indicator. Back it dropped to thirty, to twenty, back, back! With an effort I pulled myself up high enough to peer out into space. The moon was behind us, all right, but it was so close that it must pull us back with only one transmission beam to propel us! Back the meter dropped to ten, to nine, to eight! Would it never stop? We could once more move about without great discomfort. Our eyes were glued to the indicator. It was still dropping!

"More, more!" I shouted to Calloway.

"Can't, Bell, can't!" was the frenzied reply. "You've got ten times normal power rating now, and this station is a living hell down here. We've done all we can, and this generator may blow any minute! All of the breakers are wired in. Everything is done that can be done—so help me!"

IF eight million horsepower would not pull us out of the moon's attraction, nothing could. The acceleration meter had dropped to a reading of one foot per second per second. We could hardly notice this force. At any moment we would slip past the zero line and be accelerated back to the moon again. This time there could be no help, for it was three quarters of an hour until two generators could combine their fringes to give us the double-powered beam we needed.

Zero acceleration! With horror we saw the needle. We had cheated our fate we thought, but we had merely prolonged our misery by minutes.

"Number five and seven rockets!"

I shouted. "Quick! Lie down, everybody. This will jar us a bit."

These were the only rockets located to be of value to us in using them to propel us from the moon. There was no sound in the outer void, but we could see the brilliant flares as the shadows danced on the walls. For two minutes, as the rockets discharged, the indicator climbed slowly to an acceleration of three feet per second per second, but it dropped slowly toward zero once more. We had used our one and last means of passing the critical point where the moon's attraction and our beam's repulsion were equal and opposite.

Zero acceleration again. But the indicator did not change! Our velocity was being maintained at least, though we were not accelerating toward our destination. If we could keep that up, the generator of the beam would eventually accelerate us again as we gained distance from our satellite. If only nothing happened at the power station! A thousand percent load, even for a few seconds was dangerous to everyone within miles of the transmitter. Yet they were taking this chance for us; they could not fail with such courage, and they did not! Perceptibly only, at first, the pointer hovered above zero. Then slowly, ever so slowly, it rose definitely toward the one mark. It passed this and the two mark.

"We've won, Calloway, old man!" I shouted feebly. "You can cut your power, but, whatever you do, take it slowly. I'll try and maintain one foot per second per second constantly. Cut her down."

With much relief, I knew Calloway cut his power output at the station, as I watched the meter closely as it gained constantly, more rapidly all the time. We had won the closest bat-

tle I hoped ever to be in, and I knew the rest realized they had experienced the closest escape possible. We had cheated death by the smallest of margins.

When the power delivered over the beam was back to normal, and the moon was noticeably drifting from us, I said, "Believe me, we'll plan our return trip with a little more leeway than this one allowed. The moon will be on the other side of the earth when we hit that spot next time!"

There was not a single voice of disapproval. That point agreed upon, we relaxed once more with a little more assurance of a safe journey thereafter. We again marvelled at the panorama, slowly changing about us as the planets followed their paths, but never losing any of its matchless beauty.

The day came when we must begin to decelerate. The battle with the moon had cost us only a few hours of our trip, so that we were confident that we should not be so very much longer than we had at first planned. Calloway managed the transition nicely, causing little discomfort to us, though we did try a little floating about, retrieving articles which had left their places at zero acceleration as they had twice before.

We had very little trouble with the bits of celestial refuse in outer space, but it was becoming more and more apparent that we were to have some trouble avoiding the larger bodies, some many miles through, which were approaching. Our simple glide was becoming more of a weave as we changed our course for the larger bodies thousands of miles before we reached them, and rayed the smaller ones which came too close. As these space missiles became more numerous, the men at the screen and ray con-

trols were doubled, then tripled. It was not as easy as we had at first thought it would be. We were never in great danger, but the unexpected swervings and bouncings could not go unnoticed even in view of the fact that Mars was becoming a very definite globe with definite markings. Our ride, after a few days, had become more like the beginning in smoothness, and we forgot our rough treatment. The chief engineer reported that our rockets were practically depleted. We did not allow this to concern us much, however, for we were looking at a planet never before seen so close and in such detail by any man from the earth.

GREAT stretches of reddish-yellow covered the surface for the most part. The darker lines and patches ran regularly to junction points as we had seen them on charts of the planet, but we had never seen them in such detail. Wisps of clouds could be detected over these darker patches, but none were evident over the vast expanses of lighter-colored surface. It was becoming apparent that these red patches must be deserts, devoid of vegetation, and, that the darker streaks were irrigation districts where vegetation grew. The clouds over the latter verified our thoughts. Just a matter of two or two days and we should land on this planet, fulfilling a vision which had long been dreamed but never before accomplished. With what we might learn, the earth's civilization might be advanced a million years in one step.

Our pleasant contemplations were suddenly interrupted by the radio operator who reported that Calloway on distant earth was calling.

"The space-ship has again been

sighted near the earth!" was his anxious message. "It is again approaching directly, this time at a velocity of a million miles per hour. Their objective is obviously the earth. They are traveling toward the beam and should reach it in about twenty minutes! Bad weather, almost universal over the globe, has prevented their discovery before this time."

After many months, that menace again! And here were we, almost at our destination and helpless. Without question, the beam would be stopped again, but, this time, the safety devices would prevent the destruction of the power units. The trip would again be jerky due to sudden cessation and restarting of the conductor beam. We would get enough power to reach Mars safely, for the enemy space-ship would not continue its raying after the beam transmission stopped. Then, before they could ray again, enough energy would reach us to decelerate sufficiently so that, with the help of our few remaining rockets, we probably would not be greatly damaged in making contact with the Martian surface.

"Turn on all beams," I told Calloway. "This space-ship may pick on the wrong ones at first if she does not know just why these beams are being transmitted. Give us about thirty feet per second per second negative acceleration now, and you watch the deceleration if this beam is cut off at any time. This great increase is necessary to reduce our velocity to the correct figure, but we can stand it, we must!"

The enemy space-ship did pick up another beam when all were projected. After its reappearance, it was again rayed. After the third appearance, the space-ship became vexed, and, without warning, changed the

power ray to one of utmost destruction, comparing with the most appalling used by Sarians and Poruvians, which we had witnessed in battle years before. Now the space-ship did not attempt to cut the rays of the other beams. She destroyed them one after another. Cold sweat stood out all over me. It was only a matter of minutes until our propelling beam would be swept from us, and we should be dashed to pieces on the planet which we had hoped, after our earliest misgivings, to reach in safety.

Suddenly there was a cessation in the pulling feeling, and we continued on, after we picked ourselves up, only bruised, on to Mars, with nothing to prevent our extinction this time. Our transmitter had been destroyed! Even if some remained, and they attempted to catch us when the earth's rotation permitted this to be done, they would be wiped out too. There was no hope this time. Again all was black despair. We had been so near success and so deserving of it after our struggle with the moon, that we had been nothing but confident of the outcome.

"Nothing to do now but use our rockets to avert direct contact," said Kroelich. "We can miss Mars by using them now, due to the fact that we are still millions of miles away, but we shall eventually be dashed to the surface. It is our only hope if one or more of our transmitters is unharmed on the earth. I know Calloway must have had the presence of mind to shut down those remaining after ours was destroyed, but when he uses them again, if the space-ship remains, they will go too. A lot of fun those invaders must have in their practical jokes! Here we are out in space, all set for a perfect annihilation. Pioneers do not deserve such

treatment, but I guess they always get it. That is the glory of being a pioneer. At least, our names will be written on golden tablets for coming generations to gape at, and a monument will be erected thousands of feet into the thin Martian atmosphere at the point of our demise. They may even build a stairway to the bottom of the hole we will make, out on one of those desert plains. The Martians will pay good money to see the remains of the first ship from the earth to reach Mars!"

THERE was nothing to do but fire the remaining rockets to change our course to miss the red planet. If we should escape its attraction, which was very unlikely, we should soar out into space and die of starvation and cold in a few weeks. The rockets were fired, and our course deflected sufficiently to miss our intended goal. As we passed over it, the glories of detail were lost upon our numbed minds. Only too soon we should be there ourselves. The Dean half-heartedly calculated our probable flight, first a great ellipse, then a series of contracting spirals until, finally, we should graze the surface and become part of the dust thereon.

Hours passed, and we had begun our backswing. For days we hurtled through space, coming ever closer to Mars and her two moons. Perhaps we would hit one of them and bring the end nearer, but it became evident that we should not. Mars had been our destination from the start of the journey, and it was to be.

No panic this time either, just resignation. We were cut off completely and permanently from the earth as far as we were concerned.

"At this rate," said the Dean after a lengthy calculation, "we have but

thirty-six hours to live! So at least we shan't die of starvation. Let us make the best of it! No need to mope about it, for the end is inevitable. For you, I am sorry, most sorry for Lele, but we have had a great experience in the last few years, and no men could have accomplished more for good than we have. I am an old man and know that there is little use in trying to hold off what must be. Life is a precious thing to us as individuals, but, in the scheme of things, it is prolific. Life is everywhere. But our names have been engraved upon the very walls of heaven itself as the first earthmen to conquer millions of miles of space. We have done what we intended, and, Bell, do not blame yourself for having put forth the idea. I should not have missed this for—for life itself! So be it."

"A toast, gentlemen, to the brave ending of a brave band in a brave undertaking!" said Lele.

We drank. I doubt if I tasted what ran down my throat. I knew my throat was extremely dry, my whole body felt dry. I wished I could end the misery then and there. But the Dean had said we must be brave! I would be, for Lele would be, and so would all the rest of them.

The entire crew sat at the long dining table made up of various tables covered with heterogeneous table cloths. No one was at the controls for no one need be. We did not break the solemnity with artificial gayety. The effect would have been ridiculous. The conversation was calm at all times about things on our earth, our home. Now and then one of the crew broke down under the strain, but, for the most part, it appeared as serious as a conference over some problem.

Suddenly the ship gave a tremendous lurch that must have strained

every girder in her. Tables and men rolled against the wall, and there were shouts of surprise mingled with those of pain as we attempted to regain our feet. A meteor? Perhaps it would be better to end it all suddenly by instant annihilation in the absolute zero of space. But there was no leak anywhere or we would have known it instantly.

A tremendous force was acting upon our space-ship. No one could stand upright. I crawled, as best I could, along the wall. The pressure was so great against the wall that I felt as if I were tearing the very clothes from my body when I moved. What I saw astounded me. The acceleration indicator stood at minus fifty feet per second per second, and it was being maintained there! No sound from the radio transmitter so it could not be an earth beam. And what an unheard of power. Certainly this did not originate on the earth.

I relaxed upon the floor, gasping for breath. The deceleration did not cease. For two hours it continued, but through blurred vision I saw the planet looming larger and larger. Our striking would not leave as large a hole as Kroehlich had thought! I laughed a funny, gurgling laugh.

As suddenly as it had come, the power ceased, and once more we could walk about. Lele had suffered pretty badly under the extreme pressure, but she revived after a short time. Our discussion of the strange force got us nowhere. We had completed another revolution about the red planet, but we were approaching its surface at a tremendous velocity. The reddish waste lands began to show rises and depressions and other slight details. For the most part, erosion had leveled off the landscape until it was very nearly flat.

ANOTHER tremendous shudder! We were in for another siege apparently. This repetition started our trains of thought anew. As well as we could, we tried to discuss this phenomenon. This time I noticed that the vector of the force was moving from the planet. Our orbital velocity was not alone being checked, but our descent as well. As before, after two hours, we were released. A check on our velocity indicated that our speed was only a major fraction of what it had been before. A new hope had sprung up within us.

"Don't you see," the Dean was saying, "each time we pass over that spot on the surface, we are captured by that beam. The Martians have a conductor beam too. They have watched our plight and perhaps had just completed their installation. Fate decrees that this mission has not been in vain. We will land safely!"

If we were to land safely, it was evident that the beam would have to hold us the next time, for, if we passed out of its influence again, the acceleration effects of the planet upon us would bring our space-ship to the surface to be dashed to pieces before we could reach the conductor beam.

"They may be able to do it, but it will be so close that it won't be funny!" said Pearson.

Kroehlich looked up from his figures. "It does not allow us a hair's breadth for error, either!"

"We must hope," said Lele in a whisper. She was apparently very ill from the great stresses to which we were being subjected.

I hoped fervently that the next attempt, if successful, would not take her life. We were placing her in the best possible position before the final struggle.

We were not many hundreds of

miles up, as we approached the zone of the beam, and our descent was more rapid than our planet-circling velocity! Again that titanic power took hold. What a generator battery they must have had behind that beam! The velocity indicator was dropping slowly but surely as the ship seemed almost to groan in the grip of the giant. We were nearing the end of the zone of influence. No, we could not hope to make it, and we had not a single rocket to aid us! Now came a tremor through the ship. My ears sang, my head was swimming and slowly consciousness left me.

Someone was shouting when first I became aware of my surroundings. What? Could we be standing still? No, there was a feeling of lightness in my body, but it was that imagined in a descending elevator. I looked out of the port. We were no longer circling Mars. We were being lowered gradually to a definite spot in one of the centers of the canal networks. We had been saved!

But Lele looked dead. No breathing was perceptible, and, in my sudden frenzy, I forgot all about our safety. I saw dancing lights, heard myself shouting, felt many hands holding me, and then all became blank.

My next sensation was that of a strong mental urge, as I regained consciousness, a peculiar urge which seemed to be shaping my mind, irresistibly. Next, I saw a picture of Lele before me. She was stretched out on a cot in a strange room, but she was not dead! There was a faint smile on her lips. Then I heard familiar voices. Pearson, Kroehlich and the Dean were all with me. I made an effort to open my eyes in which I succeeded, but the apparition which appeared before them made me close them instantly. What demon of hell had I seen?

"It is all right, Bell," I heard Dean Harvey say. "You are on Mars, and you will find things a bit different. You are bound to expect that!"

I opened my eyes again and studied what I saw before me very closely. I must be looking at a man, a very, very old man. A man so old that his age could not even be approximated! Even his bald pate was one mass of wrinkles. He was bending over me, clad only in a white wrap which was merely hanging on him. He was thin, very thin, but, I decided then he must be a man.

THE most startling thing about him, and the reason I had so suddenly closed my eyes the first time I saw them, were his eyes. Such strange eyes. As I studied them I realized there was nothing to fear. I felt a peaceful wave sweeping over me. The eyes were large really, and not only because they were accentuated by the drawn features. Their color was indefinite, but the striking thing about them was that you could look for untold distances into them, into something partially veiled, a misty, unknown something. Again the picture of Lele on the cot came before my mind, seemingly forcibly, blotting out all other things and thoughts. The picture again faded as the man turned his head to the Dean.

"Bell," said the Dean as he stood beside my cot and put his hand on my shoulder gently, "this is a strange world, and this man is trying, in his way, to tell you something. It is your first experience in thought transmission. Open your mind and do not resist the train of thoughts, which will come before your mind's eye. You can talk to him too by merely thinking your questions. He cannot read your

mind unless you relax control voluntarily."

I looked into those mysterious eyes and passively awaited the thoughts which would make up his part of our conversation. He took the adventure back to the point where I had found Lele, apparently dead from the violent forces to which we had been exposed. There I was beside her. I began raving. I had gone stark mad. Pearson, Kroehlich and three members of the crew had all they could do to hold me in my frenzy. They managed to get me to another room and keep me down.

The ship was swiftly nearing ground level where throngs awaited our arrival at the transmitter station. We reached the landing platform. Carefully Lele was brought out and carried into the building. I was brought out fighting furiously. Lele had not been too far gone to bring back to life, and the utmost was being done to bring her back. I was being strapped down and given injections to quiet my shattered nerves and warped mind.

But, I interrupted, I had seen Lele with a smile upon her lips, and she looked almost recovered. The answer flashed back to me was that I had been out of my mind for three whole weeks! The picture faded. I was bewildered, yet it must all be true. The surroundings were certainly strange. The old man arose and slowly walked from the chamber.

"Wait until we tell you all about Mars!" exclaimed Pearson. "You don't know a thing as yet. We certainly worried about you a-plenty, but that old man pulled your mind into shape again in spite of yourself! You certainly were gone when we brought you in here."

From the three of them I learned the history of the dying red planet. The first seed of life which fell to the surface came from a passing comet's tail. In fact, millions of these microscopic things fell all about the planets of our system. Mars was then cool enough to provide a breeding ground for them in the steaming oceans which once covered almost the entire surface. They grew and grew and grew. Hundreds of thousands of years passed. The seas were full of these little things, single cells. They did not move, but drifted with the currents. The oceans were becoming green and slimy with them. Once in a great while one differed a bit from another, but, as a whole, they were very much the same. Millions of years passed, and some had become capable of slight movement. As time passed, some became distorted in shape. They were two-celled instead of one-celled.

Down the long line of history evolution was taking place. The earth was cool now, and some of these cells, borne by light pressure, reached the earth and multiplied in the seas. On Mars development had progressed and soon there would not be many of the original sensitive cells. Bigger things were using them as food, things that had developed from them!

From all of this came the plants, the animals, and, finally, on Mars, at least, man, the highest type of animal which could be developed from the seed sown from the comet's tail so many ages back. Unquestionably the various seeds in the universe would lead to other highest types, but they had not been sown within our system. Our evolution had been the same as that of Mars because conditions had also been the same, only Mars was a billion years advanced from us. Strangely enough, the population was

only a few million, and this number was decreasing slowly through the ages. Millions of years before, astronomers had sighted a large body which, they predicted, would pass altogether too near Mars for comfort, and finally this body would plunge into the sun and be consumed within it. This body would tear about half of the atmosphere from the planet.

SINCE the prediction was years in advance of the actual occurrence, there was time in which to do something to prevent the destruction of the life on the surface. Vast areas were covered, hermetically sealed from the outside air. Endless caverns were dug beneath the surface. Everything was done which could be done. There were skeptics, of course. There was laughter, but panic resulted when the heavenly visitor did become visible. Still human nature discounted the seriousness of this new bright body in the night sky. It was too small to do any damage, and with that, the panic subsided.

But the body grew constantly in size. It became as large as the sun in appearance. Thousands died from the tidal waves, the hurricanes, the vast upheavals caused by internal strains. It was a wonder that anything lived when that body passed within a few hundred thousand miles of Mars. It tore from her half her life-supporting atmosphere and ended by plunging into the sun. This rocked the very solar system to its edges and a piece of the sun was hurled off and established an orbit about the earth. The terrific disturbances which occurred on the earth as the new balance was being acquired were visible to the Martians scores of millions of miles away. The few thousands left living on Mars managed to exist. Gradually they en-

larged their artificial homes and grew to be a mighty race once more.

As time went on, their bodies would not need to undergo changes in form to exist as the air envelope would become more and more tenuous as millions upon millions of years passed. There would be no more slow adaptation necessary. They could live even after the planet was cold and barren of air as the moon is now. They could live as long as the sun shone; even longer than that, perhaps. They were a haughty and a mighty race!

There was sufficient air remaining after the cataclysm for some vegetation to grow, and promising results were obtained by pumping carbon dioxide out upon the planet's surface. This not only helped plant growth, but formed a fair insulating as well as diffusing medium. But aging of the planet did not have only a few results. Water was getting scarce. It was chemically manufactured, at a tremendous cost. Synthetic food was tried, since animals had become almost extinct, and now vegetable life was too costly to eat. This new food did not give the hoped for results.

As a last resort, the birth rate was cut. The population, billions before the change and hundreds of millions after it, would be reduced gradually until the balance was met. This was about the time that things were crawling from the seas out upon the land on the nearest planet, the earth. The span of life had been prolonged, and, with the decreased population, it was a simple matter to delve more deeply into the mysteries of the universe. Atomic power was developed and served to perform all of the work necessary. This led directly to abstract thinking. The time came when the solar system passed through the most gigantic comet the galaxy had ever known.

Very strange things happened then. It was found that mind, pure mind, existed in the tenuous tail of this monstrous comet. The influence of this strange phenomenon could be felt by everyone. It stimulated thinking. It soothed. It mended. Years went by and the comet, still a gorgeous sight in the heavens, had hurtled away from the sun, but its influence had remained with the Martians. In the millions of years which followed, mind was uppermost, not material things. By mind, matter could be controlled. Thought-transfer became the common means of expression. It was complete in detail, and lies were impossible because detail must be lacking in an untruth. It was only a matter of establishing a conducting path between minds for the transfer of thought.

Then another strange thing came to pass. Logic had been a means of foretelling a good many happenings. Some people were going from logic and foretelling events which happened and yet were not logical. There seemed to be an indefinite something which gave them this uncanny power. They had thought of building space-ships and migrating to the earth which was now almost identical with what Mars had been eons before. But this mysterious something warned them that they should remain and build up their empire of thought.

They had known of the coming visit of earthmen to the planet, though they knew not when or how. They waited. They knew ages before our time that marauders of space were on their way to capture a new world for themselves. They knew the moment our beam struck Mars that they too must build such a transmitter. The reason was not quite clear, but the impressions were definite that it must be done, and it was done. Had it not been for this

uncanny power of prognostication, we should have been angels long before then.

"Wait, wait!" I transferred to him. "Three of you can tell me more than I can absorb at one time. You'll get me down again with any more of this. I must see Lele!"

I WAS a bit shaky, but I could walk by myself though I almost fell at first due to the decreased gravitational force. I had to take my time to become accustomed to the new condition. Lele was indeed alive. Her smile was not even changed, her love for me was not changed, she was not changed. I was wrong in the last statement in one respect. Though we spoke of it only once and then only in a few words, she carried always, less and less as time went on, of course, the faint shadow of having looked into the eyes of death. I knew what it must mean to have died and lived again, and I asked for no explanation. I wanted none.

We spent weeks looking over the marvels that this ancient world held. We often donned pressure suits and walked through the growths outside the covered city. Now and then we saw a peculiar animal, always small, which had survived the first loss of air and had adapted itself to the ensuing slow loss of air and heat from Mars. These animals were rare. The vegetation was most peculiar and pale looking. What inherent vitality it must have to live under such adverse conditions.

There was really no form of government for there was no one to be governed. Selection had weeded out the undesirables ages before. To be sure, while I had first seen a man three hundred years of age, there were babies, boys and girls, and matured people as well. In fact, Pearson

had found it out very definitely. We were guests at the home of So-dek who had a radiant daughter about twenty-two years of age, and there had been a mutual attraction between them. I at last had a chance to get even with Pearson for his teasing me about my official title. I reminded him on several occasions that he had fallen in love with a woman old enough to be his mother. This was because a Martian year had nearly 687 days in it (687.71 days), the days being very nearly the length of our own earth days, or about 41 minutes longer. He became so angry at times, that, though his mouth moved, no coherent sounds issued from it. It became obvious, if we ever did return to earth with him, that Vola would return with us. There was no need to attempt separating them.

We had been informed that the space ship which had been attending the earth ever since our arrival on Mars, had again gone out into space. I knew that in two months, by the superhuman efforts which would be made on the new beam transmitters, barring the return of the space ship, we could hope to return to the earth. We had established communications with Calloway again for a few hours a day, at least, over the Martian beam. The protective measures were rapidly assuming definite shape, and, if the space ship did not return to earth before we did, we could surround the earth in a pretty fair coat of electronic energy armor!

My curiosity regarding the mental attainments of our hosts never could be satisfied. I tried time and time again to receive the picture of this mysterious guiding something. All I got was something nebulous. The impressions were always of unthinkable vastness, a vastness which seemed to

dwarf the all of creation. Pearson received the impression of a great maze of something, and the others did no better than we did. Once or twice before, a thought had missed me in talking to these strange men. The gap seemed rather a shock after an orderly train of mental pictures. Usually the Martians would approach the same idea from a different angle, and I could then understand them.

I wanted to know more about these marauders of space who had caused us such a goodly measure of grief and time and material. Their physical appearance was completely lost on me because I had nothing by which to judge it. My ideas were only connected with things I had seen or had seen in pictures. There was always a yardstick handy for comparison. But these creatures in the space ship left a blank. The Martians knew what they looked like, but they could not even draw a picture of them, which we could understand. Little had we dreamed that such a difference could exist! This was one of the reasons for thought transference, which to them, had no limitations in amount or degree. Apparently we had not developed sufficient adeptness and never should.

WE did learn that they had migrated from space so remote that when they left on their journey our galaxy was but in the process of formation. They had been driven out by superior beings of much higher intellect, who came marauding from elsewhere in space.

Altogether, the Martians knew of several hundred different types of sentient beings, and not a single type could be described to us. We asked as to the atmosphere and other physical characteristics of the myriads of

planets, and found they varied greatly. In fact, the space-ship had picked the earth as the first world which reproduced home planet's conditions, of all they had explored in endless light-years of space-navigation. To our own misfortune, they had apparently decided to take possession of our earth for their own. They had looked over Mars too, but it was too far gone to be to their satisfaction. These beings were naturally tired of living from space radiations and tired of traveling for countless ages to find another suitable home. Only in our solar system had they found a second to their own. This fact staggered us, for we could not even conceive of the number of worlds these beings and their ancestors had explored since the formation of our galaxy. The thoughts made no impression at all.

At last the long-awaited day of our departure for the earth had come. Vola was to accompany us and become the mate of the beaming Pearson. Weddings were not upon Mars, but Pearson insisted that the formality be carried out when we reached the earth. Lele and Vola had become the very best of friends. Here we had three worlds represented on one space-ship! The rocket tubes had been replenished. The ray projectors were checked along with the screens. We were going to travel homeward in less time than we had come. There was no guessing when the enemy space-ship would come back.

As a last bit of advice, a couple of the sages "told" us most cheerful news, that the ship had signalled a vast armada, that a world suitable to them had been found, and this fleet was on its way, traveling at a tremendous velocity. Our hearts sank. The men had assured us that we should reach the earth before our ene-

mies. So it was written to them in their minds by this unknown power. The earth would survive, but a great change would take place, and, after this one visit, a wall would come up between the two planets, a wall insurmountable for countless ages. That was as much as they could tell us. We thanked them, though we had no need to tell, since they could read the thoughts in our minds as we spoke.

Calloway had made contact with Mars and we were off! Ten-feet per second acceleration this time. It was a bit more uncomfortable, but the girls seemed none the worse for it, so we left it at that figure. We were on our way home, racing with a fleet which meant to capture our earth from us. We had a chance now that we were prepared for them. All the way back we spoke of little else until Lele and Vola left us to our plans and spent most of their time together, Lele painting a glorious picture of the world to which we were going. I wondered how changed it would be. I could picture what it probably looked like then. Power stations everywhere for the ray screen. Beautiful forests demolished to install great destructive ray projectors. Everything torn up to defend the earth from her space enemies. What was the use of saving a hulk which no longer had anything of beauty left on it, save for the people? Yes, we must save the billions who needed us. If we won the battle, the forests could be replanted and the landscape again made pleasing to the eye.

When we were only three hours from the earth, the great fleet was sighted bearing down with inconceivable velocity upon the apparently defenseless earth. I could see now why the first ship had not destroyed us.

She would eliminate the intelligent beings without destroying the surface. Perhaps, under that mask of cruelty, forced on these creatures by eons of wandering, they had love for beautiful things. A fight was inevitable since they wanted what we wanted, one and the same thing, and we were in possession of it and always had been.

We landed on the earth just as the protective screen was thrown about the globe. The armada was the most appalling thing I had ever seen. Ten thousand engines of destruction were gathering to take the earth! They undoubtedly expected to land without any opposition and perhaps kill us off with poison gas or something of that sort. I do not believe they were prepared for what was to happen.

THEY were slowing down, visible to the unaided human eye as tiny beads out in the moonlight. As hours passed, they drew ever nearer, just cruising to prevent the air friction from burning them into ashes. They kept coming on, expecting to make an uncontested landing no doubt. When only a few miles out, one of the ships apparently sent out a weak ray as a feeler. The invisible screen showed a bright spot. They had learned that we were ready for them! How ready, we did not know, for ten thousand spaceships drawing their power from the endless radiations of space gave us the most formidable enemy I could imagine. They had gone light-years upon light-years and yet had come through unscathed. Suddenly I thought of how puny our resistance would be to such a superior enemy. However, the earth was our earth, and, no matter how poor a show we would put on, we would do our best. Millions of men were at their stations. We were ready. Hardly a breath could be heard in

those endless minutes before the display began. Several more feelers were sent out by ships at different points and, each time, a glow showed them we had an electronic screen without a break, fed by units capable of delivering quintillions of horsepower to it.

Why not start the battle ourselves? It was possible that if we caught them off-guard, we could get in some destruction before they started their hammering. Accordingly, orders were instantly relayed to all ray guns in range. Four of the foremost ships, giants as they were, were suddenly propelled toward the earth by powerful attractor beams and then squeezed by a repeller beam with the former still acting. Under this enormous compression, these mighty ships turned incandescent and were suddenly shot out into space with a terrible scream of protesting air as the attractor beam was cut off. We had done a good job that time, but the other spaceships opened up on us the moment the results had been interpreted, which was not more than a few seconds at the most.

The terrific onslaught of beams from the invaders threw up the whitest sheet of flame from our screen that I had ever witnessed. It seemed that the screen could never hold, but it did. Special destructive rays were added to the attackers' first rays. Now the screen showed beautiful flashes of color, if they could be called such, with balls of energy shooting off miles into the atmosphere. The odor of ozone was almost overpowering and would soon burn our lungs if we had not put on our filter masks.

The ships were spreading out, seeking a point of vantage, some weak link in our screen, but there was none.

The scattering was to our advantage for several reasons. First, it was less dangerous to have the screen attacked at many points rather than a single concentrated point of mass attack, and second, we could not use our own rays effectively. The terrific radiations had made vision through them an impossibility.

The battle had begun in earnest. How surprised the invaders must have been to find that not a spot on the globe was vulnerable! Now and then an enemy screen was opened for a split second. This was long enough to send that ship off into space, an unrecognizable hulk with molten metal dripping from it and gaping holes in its sides. The pyrotechnic display exceeded by far the magnitude of that when the Sarians attacked Poru. There we had witnessed the dissipation of billions of kilowatts, but here these figures were dwarfed almost to insignificance. The night was brighter than day. In fact, we were unaware of daybreak when it did arrive. I do not doubt that the spectacle was visible to our friends the Martians, scores of millions of miles away.

At times our screen was hard pressed, but we managed to concentrate enough energy at the danger points to prevent a break. One such break would mean our end for an inconceivable wave of destruction would wither us into gases in a fraction of a second.

Quite suddenly the battle ceased as the enemy ships withdrew. We awaited their return with less fear than we had their first attack. Apparently we could hold our own against them. Perhaps the Martians had been right in their forecasts!

There was no more attacking that day, but the ships remained out in space, in formation, as if they were

in conference. Nor was there any change the next day. The ships remained stationary day after day, never sending out a ray! Our screen was still up, but it was unnecessary. We lowered its intensity, keeping a very close watch for a rush attack, but we did not dare cut it off completely, for fear they were merely attempting to trick us into such an act.

Carter wants to see us immediately! reported Calloway. "He has some very strange news for us, he says."

Carter, the astronomer, burst into our master control room. He did have news that stunned us. Unbelievable news we were positively certain. The space fleet, by its combined power, had begun to move the earth from its orbit. We could see nothing to be gained by it. At least we did not for weeks to come.

WE immediately began our offensive warfare anew and hurled the mighty destructive rays upon the armada. Their screens flashed brilliantly and great flames and coruscations flared in many colors. This did not last for long, however. They needed all of their energy for the work at hand, and withdrew a sufficient distance to make our rays totally ineffective, a matter of a hundred thousand miles, and there they remained, pushing the earth farther from its orbit every day!

"Evidently they intend to freeze us off the earth and then drag the earth back to its place!" said the Dean. "I never thought it could be done, but those giants are doing it, and they have all of the energy they need to carry it out."

So that was it! Months passed, and still we moved farther from the sun. What an undertaking was theirs! It would save demolishing the earth,

which they certainly could have done, but did not wish to do, since so long a search had been necessary to find it. And we had thought we were holding our own against them with our screen, mighty to us, but hardly any resistance to them. They knew breaking it would deface a large area of the planet they so desired for their own home. What puny defenses we had against them actually! But still we considered ourselves fortunate in one thing. As long as the earth was not destroyed outright, we had a chance. We could convert many of our atomic generators into heating units to warm the earth's surface. This would help for a long period of time. This work started immediately when we realized the invaders meant to carry out the plan they had begun. Perhaps they would give up the project when they realized how stubborn we were. We could only hope so.

Years had passed! The earth was a strange one now. The ships were still a hundred thousand miles away, but they were doing the job they had begun. Every now and then one of them would come in closer to test our screen, and, finding it still up, would join the other ships. We were supplying a tremendous amount of heat to the rapidly cooling earth's surface. The sun was now so far distant that the light at midday was less intense than the light of the full moon had been originally. We had come to our last days! Every day the temperature was dropping. We could not seal the population underground for then we could not have operated our screen or our offensive weapons. The mean temperature was 150 degrees below zero! We had used all of the atomic converters we dared to, for heating purposes. The oceans were freezing over, and the Great Lakes were solidifying to their

very bottoms! Before very long we should fall an easy prey to the space-vandals, and the earth would be pushed back to the warmth of the sun and rewarmed to its original temperature. After the ages the invaders had spent in search, a few years meant nothing to them, once they had found a new home for themselves.

"We are approaching some very peculiar space conditions," said the Dean one day. We hardly heard him. "I have never heard of such a combination of static and magnetic fields. Of course, we had no way of finding such a spot from the earth's original position. Our instruments are doing all sorts of peculiar tricks! Too bad it is unnecessary to do any investigation. Our enemies will have us beaten in a very few days. In fact, if they attacked now, I think they could easily overpower us."

"I know they could," I replied grimly. "Our screens are down! The scout ship is due almost any hour now."

"Scouts coming in again!" came the call from the observatory.

I jumped to my feet, calling Lele and Vola. "The end has come!" I shouted. "We have faced death many times before and laughed at it. Let us laugh at it again!"

We did laugh! The scouts undoubtedly had discovered the ion screen lacking for they were coming in fast. They were landing!

JUST as they touched the surface of the earth, something peculiar was happening. I had a sensation of a tremendous tautness as of a stretched steel string about to snap.

Everything was becoming wavery and indefinite before my eyes. The earth itself seemed to be trembling! The others noticed these strange things too, so it was no figment of my

imagination. There was a prolonged period of dreadful nausea, of a head-splitting pain and then a definite bump.

From outside a brilliant light, like sunlight, was shining through the heavily frosted windows. What manner of power were the invaders using upon us? The Dean let out a shout and ran to one of the windows, smashing it wide open with a stool. It was a brilliant light. We all ran to the window and peered outside. There was a sun in the sky, a big, white sun, bigger to us than our own ever had been! What had happened?

The Dean was running to the controls. He was shouting, "I want just two shots at them!"

He manned a giant power ray control and trained it carefully. The two space-ships, as bewildered as we were apparently, remained before us not a thousand yards away! They were perfect targets.

"Take it easy, Dean, or you'll blast us to kingdom come with that toy cannon you are handling. They cannot get away now!"

The Dean did take it easy and slowly reduced the two space-ships to molten metal. That hot blast felt good through the terribly cold air about us. I felt that we had ended our terrible struggle against an invincible enemy. We searched the heavens for the rest of the fleet, but no observatory could find a single trace of them! That night, we had the greatest surprise of our lives. The Dean told us he had something of a surprise in store for us, but we never even dreamed then what we knew.

"Let's all have dinner below," he suggested, trying to appear calm, "and we'll all come up after dark for the treat!"

"But, Dean!" we all protested.

"How did we get back to our sun in such a hurry and with so few ill effects?"

"Who said anything about getting back?" he chuckled. "No more questions until tonight! I think I can tell you all about it then."

The dinner, in this mind-shattered world of ours, was the most joyful thing I can remember. The world was enjoying the greatest emancipation which had ever taken place!

"This dodging death business is getting to be a habit, isn't it, Bell?" smiled Pearson.

"No holding hands under the table!" Kroelich warned him.

Vola blushed. "Did not my people tell you of this?" she queried in her delightful accent.

She seldom used her powers of thought transference now. She said that Pearson could say much more wonderful things than he could picture, and that made transfer unnecessary. Also, because they were invariably exaggerations, so much detail was lacking, that it was not any fun at all.

"Well," hesitated the Dean as we were all squirming in our seats waiting to go above and look at what he had to show us, "I'll just bet Carter will wring my neck for disconnecting him from this building. I expect he'll be over any moment, and I must beat him to it!" I had never heard him use so much slang before!

"What do you mean?" I asked.

"Come on, folks, I'll show you!" and we hastily followed the old man up the stairway.

It was very dark outside, but we were accustomed to it, because we had lost our moon years before, when we were first displaced from our orbit.

"Go to the windows and look outside!"

I know I looked six different times if I looked once, before I could interpret the sight in the heavens. Not a star or planet was familiar, not a constellation the same! There were gasps of awe and wonder from every one of us. Even the Dean was taken aback by what he saw.

CARTER and his staff came running shortly after our first wonderment. It was up to the Dean to do some pretty fancy explaining. He was fairly dancing up and down in his eagerness to tell us just what had happened, for none of us had guessed the truth.

"Ladies and gentlemen," he began.

"Get to the point!" shouted Pearson eagerly, and he was rewarded by a very good imitation of a scowl.

"As I was saying," the Dean continued, "Our troubles may be said to be over, so far as invaders from space are concerned, at least those which have been molesting us! We not only are in a new world, we are in a new dimension!"

In the hush that followed the pause after that statement, I could hear my own heart beating.

"If we are not, where are we? The fleet of space-ships has vanished. The two which were upon the earth's surface were destroyed. This is not our own sun, as Carter will tell you from his hurried observations, and too, such a trip in so short an interval of time would have shaken the earth into its component molecules, so to speak! This sun we have now may be close to our former sun or it may be so far distant that even infinity becomes insignificant. How can one compare distances between dimensions? I knew we were approaching a disturbance in the normal fields of space, but I did not dream that, what has

happened now, would happen! That whorl in space may have disappeared entirely from the spot we felt it, or it may have been transposed to still another dimension. Such points of instability are not so very rare in space, considered as a whole, but the one which grasped the earth and hurled it into another dimension was unusually large. From one point of view, space is the standard, while planetary bodies are merely disturbances in space, just accidents, so to speak!

"From a mathematical standpoint, there is no end to the number of dimensions. We may find, to get back to our own case, that the climate will become tropical after the earth has assumed its balance in the new arrangement, but I much prefer being warm to being as cold as we have been the past year! Folks, there is a wall between us and Mars which may never be surmounted, but we are entering a new era of happiness, and I, for one, will have nothing more to do with any plans for space travel!" With this parting remark he looked quizzically at me.

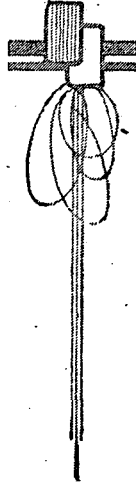
Though he was joking, I knew, it really had all been my fault. But the outlook at that moment, as we turned our eyes heavenward and beheld a black velvet sky, diamond sprinkled as we had never seen it before, told me that it had been worth all of the terror and suffering through which we had gone. I had not thought to remind the Dean that we should have fallen easy prey to the vandals if things had not gone just exactly as they had. I did not care then, for my Lele was safe once more, and our fears would soon pass with the dawning of the new day. The raw wounds on the earth's surface would yield readily to the billions of hands which would begin the mending. Our task

to do good was much greater than it ever had been in the past.

"Vola!" I heard Pearson saying, "tomorrow you must show me how to draw four planes mutually perpendicular!"

"If you think that is a problem," I said, "Wait until the Dean tries to figure out what our mathematical chance was that brought us to the warped space planes at the moment it did!"

THE END



The Chemistry Murder Case

By MILES J. BREUER, M.D.

Our readers will be glad to get a story involving a cryptogram and one which is at the same time from the hand of Dr. Breuer. Being chemically disposed, Dr. Breuer uses a very distinctive system.

ISAIAH CULP, Curator of the Chemistry Building, was opening doors of rooms and laboratories early in the morning, to let in air,

The little gray-bearded man had a merry twinkle in his eyes and a heart big enough to hold all of the students, instructors and professors, that constantly came and went through the huge edifice. Many of the students thought he ought to be a professor, for he certainly seemed to know enough about Chemistry. But he preferred to look after all of his people and the building that housed their work.

He went cheerfully along opening doors, when suddenly he stopped with a jerk with one of them half-way open, and hurriedly slammed it shut. It was the door of the laboratory in which the young Dr. Seeley was carrying on a special piece of research. Mr. Culp recognized the sweet, penetrating odor of hydrocyanic acid. It had welled out of the door, as though the room were full of it.

Mr. Culp took a gas-mask down from the wall, as though that were part of his every-day work, and carefully put it on and adjusted it. Then, looking like a human being with a strange monster's head, he opened the door again. He plunged into the laboratory, walked

quickly across the room, and began opening windows, one after another, to their full width. After a broad breeze was pulling freshly through the room, he stopped to look around.

He was not unprepared for his next discovery. The body of the young Dr. Seeley was sprawled from his stool across his desk, its head lolling and its arms flung out in an attitude too grotesque to mean anything but death. Under one hand was a mass of crushed glass and some crystals dried in streaks on the table. Under the other was a letter-size sheet of paper covered with chemical symbols. Just beyond the fallen man's arms was a Kipp gas generator, with its three bulging bellies. Its outlet stopcock was open, but the fluids in it were clear and quiet.

Mr. Culp took in these details at a glance, and also the fact that the entire laboratory was otherwise in order. He stood a moment longer looking; then tore off his gas-mask. The shock of seeing the cheerful young instructor, the brightest among the younger scientific men on the faculty, unexpectedly flung out in death, paralyzed him for a moment. He could not reason what to do next. However, he knew the Chancellor of the University well, well enough to know that the Chancellor would take

a personal interest in an occurrence of this sort, and that he would undoubtedly censure Mr. Culp severely if the matter were not brought first of all to his attention. Mr. Culp walked downstairs and called the Chancellor on the telephone.

It was early. It took time to get the Chancellor on the telephone, and more time to get the shocking message through to the Chancellor's dazed comprehension. While he was talking on the telephone, Mr. Culp listened with his other ear, and heard the outside door of the building open twice, and footsteps of someone walking down the corridor and up the stairs. They were not the footsteps of any of his janitors, he knew, as he crowded his discovery into the receiver for the Chancellor. They were students. It was early for students. The first steps were undoubtedly a young man's, and the second, quite as certainly, a girl's. Mr. Culp hurried quietly up the stairs as soon as he was through telephoning.

He reached the second floor just in time to see the young man come out of the door of Dr. Seeley's laboratory, pale and furtive. It was John Brusiloff, a brilliant student, but an eccentric fellow.

"Wha—what's happened?" Brusiloff gasped as he saw Mr. Culp.

"Your guess is as good as mine," Mr. Culp replied cheerfully, having by this time recovered full equilibrium. "But, since you've been in there, you will have to stay right here."

"How long?" asked the student anxiously. "I—I've got work to do."

"Work stops sometimes, for you, and for others. Perhaps it won't be long. Who else is in the building?"

"Miss Shane."

"Ah, Roth!" Mr. Culp said to one of his janitors whose head appeared above the stairs. "Stay here with Mr. Brusi-

loff. And nobody is to go in or out of that laboratory."

Mr. Culp started out to look for the girl. Miss Shane was one of the student-instructors, and had a great deal of ability. She also had as much beauty as she had ability; her reddish-bronze hair, her opal-clear skin with an occasional freckle, her clear, deep blue eyes had made captives of the hearts of many of the masculine population of the Chemistry Building. Mr. Culp found her at work in her rubber apron, in an adjoining laboratory.

She seemed absorbed, and looked up at him very crossly as he came in. He bade her good morning and went out again, satisfied with the fact that he had located her. As he came out, he saw approaching Dr. Kane, the head of the Chemistry Department, and, behind him, the Chancellor. In another moment the outer door slammed again, and a physician came hurrying up the stairs, whom the Chancellor greeted as "Dr. North." The group of them went into Dr. Seeley's laboratory, and stood for a moment behind the sprawling body.

"Deplorable!" breathed the Chancellor.

"A brilliant young man," commented Dr. Kane, head Professor of Chemistry.

The physician studied a moment.

"I suppose Mr. Culp is certain that he smelled hydrocyanic acid?" he asked.

Dr. Kane smiled.

"MR. CULP isn't such a bad chemist," he said. "If Mr. Culp said it was hydrocyanic acid, you can dependably base your further assumptions on that fact."

"The pink color of the body," Dr. North continued, "and the dark blue lips and finger-nails, confirm poisoning by hydrocyanic acid. That, I suppose, is what it came from," he added, nodding toward the Kipp generator.

"To check it up, we can examine the

contents," Dr. Kane began, and then went on more swiftly, "Wait. We can make sure very quickly."

He went out, and in a few minutes came back with a tiny white mouse. He put the mouse in a beaker, which he held up to the outlet stopcock of the Kipp generator. With another beaker he poured a half liter of water into the top of the Kipp, displacing the small amount of residual gas that was trapped within, and forcing it out into the beaker containing the mouse. In a few seconds the mouse was dead.

"Such a ridiculously simple accident," Dr. Kane murmured.

"Science claims its martyrs now and then," the Chancellor added reverently.

Then they looked up and saw Miss Ada Shane standing beside them and staring at the dead body. She was pale and rigid, but did not seem as much moved by the situation as were the men. Her wide, blue eyes were expressionless. No one seemed to know what to say next.

A scramble of mincing footsteps in the corridor aroused them. A succession of little flutey squeaks, a swish of fluffy, pale-green and cream skirts and sleeves and cloaks, a slow suffusion of perfume—and Mrs. Seeley, wife of the murdered man, stood there in front of them.

"Oh! oh!" she gasped. "Where is he?"

She had dark hair, brown eyes that danced like sunlight on a brook, and a vacant, baby-like face. As soon as she saw the awkwardly disposed body, that had not yet been touched, her features collapsed like a wet rag, and screwed up into a sour, tense expression. Somehow, even though it was a wife's sorrow, none of them sympathized deeply with her, as she broke out into a childish blubber, and threw herself on the body.

As she did so, it slid heavily to the floor with a thud. Beakers and test-

tubes on the desk crashed. Mrs. Seeley's arm was imprisoned under the weight of the dead man's shoulders. A number of piercing shrieks rent the air of the laboratory, until assistance released her. Miss Shane stuck her chin out in the air, and walked haughtily from the room. Mrs. Seeley was deposited in a collapsed condition on a bench.

Mr. Culp was trying in a clumsy, masculine way to comfort her, when he suddenly stopped, and a curious expression came over his face. He stared at the desk with its broken glassware and its exhausted Kipp generator, and the dead man at the foot of it. He hurried, almost leaped to the side of the corpse, looked at it closely, finally turned it over, looked under it, under the desk. He shook his head and looked blank.

"If you will excuse us a moment, gentlemen," he finally said, taking the Chancellor by the arm, and leading him far enough away so that his whispers would not be intelligible to the others.

"Yes?" said the Chancellor, mystified.

"That sheet of notes is gone!" Mr. Culp exclaimed.

"Notes!" repeated the Chancellor vacantly, trying to comprehend.

"There was a sheet of chemical formulae under his hand when I first came in. Now it is nowhere. It has disappeared."

"Somebody took it, you mean?" The Chancellor was wide-eyed. Such goings-on in his own University!

"There is no other possibility," Mr. Culp answered. "Furthermore!"

"Yes?" said the Chancellor. "Furthermore?"

"Would Seeley set up a Kipp generator for hydrocyanic acid—?" he demanded. "But, you are not a chemist. No chemist would do that. It is too dangerous. Seeley was no fool. He was one of our best men. Seeley would not generate hydrocyanic acid in a Kipp?"

"What do you mean?" The Chancellor was plainly frightened at some idea or other.

"Seeley was working on a piece of research. A big thing. A new explosive. The government was in on it. He used a Kipp generator. But he used it for carbon-dioxide or some nitrogen compound. There is no use for hydrocyanic acid in making explosives."

"Are you a chemist?" the Chancellor said. "I thought you were the Curator of this building."

"I learn chemistry as I go along," Mr. Culp replied. "Do you think that is enough suspicion for calling the police?"

"We'll ask the doctor. Doctor North!"

Doctor North, after having the suspicious matters of the lost paper and the incongruous Kipp generator explained to him, stated that he would refuse to sign a death certificate, and a coroner's inquest would be necessary. Mr. Culp, as he called the police, suggested that the Chemistry building be promptly surrounded. He gave orders to his janitors to let no one out of the building.

Then followed another hideous gap of embarrassed, horrible silence. Mrs. Seeley had sat up rigid on her bench, and her sobs caused every one to start suddenly at unexpected intervals. She suspected from the appearance of the faces of some of the men, that something suspicious was up. No one knew just how much time passed in a horrible nightmare, until a great many heavy steps were heard pounding about stairways and corridors throughout the building.

The police inspector made straight for the party. He was a disappointment to Mr. Culp, who liked people. The police inspector was not people; he was a cog in a system. He was punctiliously polite, but had no personality. He operated like a very efficient machine—a pump, or a motor, or something. Mr. Culp decided that if the mystery were to be solved,

someone with some human interest would have to get up on his toes.

A LITTLE court of inquiry was organized on benches and chairs, with all the persons heretofore concerned, present. The Inspector presided, totally incongruous among the glittering glassware, the delicate balances, the huge and tiny flasks of colored solutions. Only the dead man near him seemed to belong, when he began his systematic inquiry. It all went according to Hoyle. How long has he been dead? Who saw him last? Did he have any enemies—

"It is extremely difficult to say how long," the doctor was first to answer. "There is no *rigor mortis*. The pink appearance is deceptive. But the body is cold, or rather the same temperature as the room. It must be many hours, anyway."

"Hm. Very accurate." The Inspector did not appreciate niceties of scientific distinction. "Madam, when did your husband leave home this morning?"

Mrs. Seeley shrank from the sudden question.

"He—he—he didn't."

"What do you mean?" The Inspector leaned toward her.

"He—he wasn't at home all night."

"Well!" The Inspector spoke as though she had committed a crime in not having called him about that the night before. "Weren't you worried?"

"I'm always worried." The baby face went red and askew again before it was hidden in a handkerchief.

Mr. Culp was studying people again. He wondered. Seeley was brilliant, an intellectual hard-hitter and swift-mover. And this baby-faced moron, this pink-and-white plaything! How did Seeley ever endure living with her? Why had he ever married her in the first place? Queer thing, marriage? He had never married, himself. All these students and

professors were his wife and family. But the baby-faced wife was talking:

"He often stays in the laboratory all night. I have to stay alone." Much weeping.

The Inspector was already asking of everyone:

"When did you see him last?" He sent down several deputies to ask the same question of all in the building.

"He was here when I locked up yesterday evening," Mr. Culp said.

"In class yesterday forenoon," Brusiloff answered.

"Yesterday afternoon when I dismissed the laboratory class," Miss Shane said.

The Inspector turned back to Brusiloff.

"Are you an American citizen?" he demanded gruffly.

"No." Brusiloff certainly had a foreign look. His hair was long and queerly cut. An intensely black mustache made a black line in the middle of his upper lip. His pronunciation showed effort, as well as the effect of a mother tongue which needed harsher and flatter consonants and broader vowels than our own language calls for.

"Who is paying your expenses in school?" the Inspector continued. He gave the impression of an inexorable information-mining machine.

"Oh, friends in Russia."

"That sounds suspicious as hell," the Inspector said, though his tone was even and mechanical. He whispered awhile together with Culp.

"I've always considered him a harmless fellow and a rather good chap, though sullen and eccentric," Culp said. "I've always liked him. He belongs to the University Communist Society and takes an active part in their work. The organization has nearly been in trouble several times, and stays just within the letter of the law. He is studying organic chemistry—and has also done some work on explosives."

"Aha!" Nothing dramatic about the Inspector's tone could be detected, even though the words pointed that way. "And you say the professor here was working on explosives, and a page of his notes is gone?"

Mr. Culp nodded.

"Well, take him, Sergeant. It looks suspicious."

THE Sergeant was a big, straight man, hard as iron. Brusiloff's struggle was short and ineffectual, yet adequate to leave behind it a mass of smashed glassware and stains of solutions creeping over the floor, and also pained and anxious looks upon the faces of the Chancellor and the head of the Chemistry Department, Dr. Kane, whose hearts were broken by the loss of property. Also there were shrieks from Mrs. Seeley. Eventually the Sergeant marched Brusiloff up face-to-face with the Inspector; the prisoner's arms were locked behind him, with the Sergeant's elbows.

"Now," demanded the Inspector, "where are the notes?"

"I haven't got them," surlily answered the Russian. "I wish I had."

"Search!" the Inspector commanded succinctly. The foreign student's person was promptly and effectively frisked; the desk was gone over again. Officers were sent out of the room to check up Brusiloff's desk and outer wraps. Brusiloff laughed.

"You're wasting your effort," he sneered. "Then you'll all feel like fools."

"You mean you have sent it off already?" The Inspector showed the first sign of emotion—anger. "That is possible, of course."

"It is a very important thing," the Chancellor said nervously. "The Government is in the secret. Very strange, for a careful man like Seeley to leave it lying about."

"No," said the Inspector. "Remember

this must have happened in the middle of the night, when he thought he was alone."

The Inspector sent out messages to the postal authorities to watch the mails for the Chemistry notes.

Brusiloff laughed again. He made them a long speech, which was not interrupted because no one knew just what to say.

"The wrong track. Americans are stupid. What need is there to murder for a few notes, in a country where they take murder so seriously? Only madmen and people overcome by passion will murder. If he had some notes I wanted, I could get them easily. Without his knowing. But I have studied his work, and he has nothing. Nothing worth while yet. You are fools. This is no political deed. There is passion in it. Jealousy perhaps. Americans are cold. They do not understand human hearts. This looks like a woman's job. Where I live, we see them so often, we understand them. Even the children understand them."

The Inspector stared blankly. Several people moved as though to speak. He motioned them to be quiet. Finally he blurted, in a way quite inconsistent with his usual composure.

"Who then?"

"How hell I know?"

"If you don't know, shut up. We don't need your advice. Take him away, and I'll get out a suspicion warrant against him."

As he was led out, Brusiloff turned and said backwards over his shoulder:

"All fools. Can't see what is plain because you don't know people. A man like Seeley. He has brains. Energy. A silly child for a wife. Do you think that is all of the story? How simple you are! Look around you. Investigate the intelligent and good-looking women about Professor Seeley. Ever heard of such a thing as jealousy? That causes more

murders than explosives and formulas."

The Sergeant shook him roughly by the shoulder and pushed him out of the door. The eyes of all of the group were turned upon Ada Shane. She was somewhat pale, so that her rare freckles shone brightly against her opalescent skin; and her lips were just a little tight. But otherwise she was composed.

Then, eyes traveled on toward Mrs. Seeley. She was the complete picture of horrified abjectness. For a moment Mr. Culp and the Inspector whispered together. Then the Inspector turned upon Mrs. Seeley.

"Was your husband ever unfaithful to you?"

It was a tactless question, quite out of keeping with the Inspector's well-groomed exterior. Especially was it an unfair question to a woman who, with all deference, was none too brilliant. In reply, she bent forward and wept.

The Inspector contemplated her for a moment, and repeated, possibly a little more gently:

"Did your husband have affairs with other women?"

Then Mrs. Seeley exploded. She stood up and pointed a rigid hand and arm at Ada Shane, and screamed out in a tense voice:

"That hussy there. Shameless. Always with him. And he was always talking about her. Just because she was good at chemistry." Her voice got higher pitched and her words came more rapidly. "He forgot me. Neglected me—"

She stopped a moment and went on more quietly:

"Finally, I told him the other day, if he didn't—"

The Inspector stiffened to hear the rest of it; and, seeing this, Mrs. Seeley stopped. Her eyes went wide-open; her breath came fast. An expression of fear slowly crept over her countenance.

"What?" demanded the Inspector.

"I have a simpler suggestion," said Mr. Culp. "Remember that I came in here and saw the notes. Then I was out for a while. But, from the time I came back, that desk and that body have never been out of my sight. Therefore, the notes must have been taken during the time that I was out. Now—during that period, there were only two other people in the building beside myself, Brusiloff and Miss Shane. We are convinced that Brusiloff does not have them. That leaves—"

The Inspector stepped up to Miss Shane.

"I'm sorry," he said apologetically, with genuine regret in his voice. "A murder is a serious thing, and we cannot lose time sending for a woman searcher."

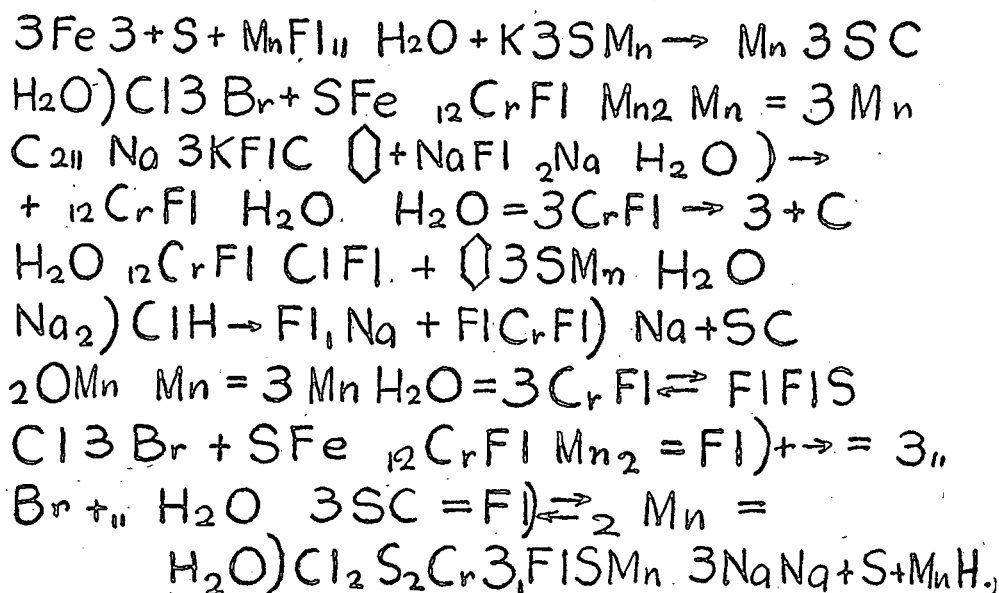
Miss Shane stood up haughtily. The Inspector, with much embarrassment but none the less thoroughness, ran his hands over Miss Shane's person. If she had had a paper concealed on her, he would have found it. Then he turned questioning to Mr. Culp.

"Her office," said Mr. Culp. He looked sorrowfully at Miss Shane. One

could see that he would have preferred to have the crime fixed on himself rather than on her.

Miss Shane moved convulsively. The Inspector nodded to the ever-present Sergeant. In a moment Miss Shane's chin was pointing straight out again and her face was set like a mask. Mr. Culp led the Sergeant to Miss Shane's office, which was in a small room across the corridor. The others could hear the whacking of drawers and the rustling of papers. In a moment Mr. Culp came back. He took the Inspector and Dr. Kane with him into Miss Shane's office. Dr. North asked to be excused and started down the stairs.

Miss Shane's office was a tiny room, containing only her desk and a bookcase. Mr. Culp picked a sheet of paper off the desk and held it up to Dr. Kane. It was covered with chemical symbols. Mr. Culp's attitude savored of the dramatic. Dr. Kane glanced at the sheet perfunctorily and looked wearily away. But in a moment he looked again. Then he peered intently, and bent over to do so. Finally he took the sheet and studied it. This is what he saw:



Mrs. Seeley stared at him in blank terror.

"What?" shouted the Inspector. "What did you tell him?"

Mrs. Seeley was weeping again.

"You think I killed him," she blubbered. "I didn't. I didn't do it. I loved him. He was mine—"

"WHAT DID YOU TELL HIM?" the Inspector shouted.

"Tell him?" She was dazed by his shouting insistence.

"Oh, Oh-h—" the Inspector roared. Then he calmed down, realizing that this attitude would do no good. "You said that the other night you told him, if he didn't—what did you tell him?"

Mrs. Seeley looked defiantly.

"You think I killed him. I didn't kill him."

"Barnes reports that two students whom he questioned saw Mrs. Seeley coming from the Chemistry Building at eleven o'clock last night."

"Now talk," said the Inspector, "or I'll send you to jail to think it over. What did you tell your husband the other day? Did you threaten to kill him?"

"Oh, no!" shrieked Mrs. Seeley, and began to tremble.

Mr. Culp intervened.

"She couldn't have done this," he interceded. "This sort of a murder requires a good knowledge of chemistry. Now, I happen to know that Mrs. Seeley doesn't—well, isn't—well enough trained in chemistry to think of such a thing, or to be able to carry it out."

The Inspector considered. It looked as though Mr. Culp, as usual, was correct. Mrs. Seeley did not look capable of an ingenious murder of this sort.

"If you'll tell me," he said to her, "what you said to your husband, and what you were doing at the Chemistry Building last night, I'll let you go home."

"I told him," Mrs. Seeley said eagerly,

"that if he didn't love me, I'd go back to my mother."

"And what did he say?" the Inspector asked.

"He put his arms around me," Mrs. Seeley sniffled, "and kissed me and petted me"—a sniffle—"and now he's dead." She sobbed several times.

"And what were you doing here at night?"

"I walked over here with him, because he insisted he had work to do. I sat and watched him at work a while, and then went home. But I felt better."

"Sergeant," said the Inspector, "see that Mrs. Seeley is taken home and left in the hands of friends."

"Good old Inspector," said Mr. Culp to himself.

"What next?" demanded the Inspector more gruffly than ever.

Mr. Culp suggested timidly:

"When Dr. Kane is up against a scientific puzzle, he takes every item that he knows, and learns all about each, gathers all the information he can. Especially the things that look rather unusual or queer. Here we have two. The lost chemistry notes or formulae, and"—bending over to whisper quietly—"the affair between Dr. Seeley and Miss Shane. Now, those notes. I just glanced at them. There was something queer about them. I can't say what. But in the back of my mind there is a fleeting impression of something bizarre, wrong, queer, about them. And we ought to know more about the queer way in which they disappeared."

"We'll have them." The Inspector was all action again. "No one went out. They must still be in the building. We'll find them if we have to take the building apart."

THE Chancellor started violently at this, and then calmed himself.

"Why—why—" stammered the wor-

thy, gray-headed Dr. Kane. "This is rubbish. This is—preposterous. This is silly. This is hodge-podge."

He paused for lack of breath. He looked blankly around him—puzzled, mortified—as though some awful disgrace had fallen upon his department, worse than the murder of one of its most promising members.

"What does it mean?" asked that human interrogation point, the Inspector.

Mr. Culp shrugged his shoulders. But he did not look blank.

"It means nothing. Someone must have gone stark insane." Dr. Kane was about to crumple up the paper, when Mr. Culp caught his hand, and retrieved the paper.

"Well?" demanded the Inspector. "At least tell me whose handwriting it is."

"Miss Shane's," said Mr. Culp and Dr. Kane almost together.

"Then she must have gone insane and killed him," the Inspector concluded.

"I have an answer that might be just a little more logical," Mr. Culp said.

"Waiting," said the Inspector sarcastically.

"This is nothing new to me. I've been Curator here twenty-seven years. These students have all seemed like my children. I've known their joys and their troubles. I've seen these things before."

"Well, spill it!" The Inspector was losing his rigid discipline.

"Nothing more nor less," Mr. Culp said, "than a cipher code in chemical symbols, for lovers to communicate with. As I said, I've picked them up years ago—"

"**A** CIPHER!" The Inspector seized it eagerly, and studied it intently for a while. His head followed the lines from side to side and there was a rapt expression on his face.

"Hm!" he finally said. "Cryptograms are not my line. But it'll be easy.

I'll bet Jackson will have it in an hour. He's an expert on solving cryptograms."

The Inspector stepped out in the corridor, and the rumble of his orders came back indistinctly into the little office.

Dr. Kane was still puzzled.

"What do you mean? A cipher?" He could not get his mind down to it.

Mr. Culp smiled.

"Merely that the kids use chemical symbols for letters of the alphabet, to keep their precious love-letters a secret."

Dr. Kane did not speak, but his neck relaxed. Finally a thought occurred to him.

"But what has that to do with this, with Seeley dead?"

"Perhaps nothing," Mr. Culp replied. "But we've got to know what it says, anyway."

"Mighty suspicious," the Inspector said. "First seen on Seeley's desk, and then snaked away secretly, and now found on Miss Shane's desk. I'm telling you that note is going to tell us something." Undoubtedly, the strain was telling upon the Inspector's previously excellent English.

"Better bring Miss Shane in here," he added to the Sergeant who stood just without the door.

Miss Shane came in and sat down. She remained pale and rigid.

"Looks bad, young woman," the Inspector said, to break the embarrassed silence. "Better tell me what you know."

A haughty silence answered him.

Something over an hour passed. Outdoors, the campus twittered and muttered with various little sounds, and the sun grew brighter through the window. The little office was gloomy and close. Its occupants were tense and embarrassed. Occasionally the Inspector tried a question: "What did you do it for?" Or a comment:

"I can't believe that you"—looking admiringly at her blond beauty—"would do a thing like that."

Only frozen silences rewarded his efforts. Occasionally a faint tremor shook the thin and projecting portions of the girl's garments. Mr. Culp's lips moved frequently, as though they were saying, voicelessly:

"Poor child!"

Once she started suddenly in her seat. The Inspector seized her arm. Then he walked over and locked the door and put the key in his pocket.

FINALLY Jackson came. He hammered on the door and reported by name. The door was unlocked to admit him, and locked again when he was inside. All the occupants looked at him eagerly, except Miss Shane, who continued to stare intently at the floor.

"Give me a hard one some day, sir," Jackson said.

"You mean," gasped Dr. Kane, "that you have deciphered that cryptogram this quickly?"

"Easy," said Jackson proudly.

"But how?"

"Well, you see"—Jackson was less apt at explaining than at doing—"you count the most numerous character, which in a note of this length ought to be 'e'. And you guess out combinations, such as 'the', and—"

"Perhaps the explanation will wait," suggested the Inspector. "Or, Professor, if you will Read Poe's 'Gold Bug,' you will find the method described in detail. The real clever thing here was for Mr. Culp to recognize it as a cipher."

The Inspector glanced at the two sheets that Jackson had given him. One was an alphabet containing the equivalents of all the characters in the note. The other was a translation of the note. He studied it a moment, and then raised his eyebrows.

"Did you write this?" he asked Miss Shane.

More defiant silence.

"It was found under Dr. Seeley's hand."

Defiant silence.

"You were in love with Dr. Seeley."

Defiant silence.

"I arrest you for the murder of Professor Seeley, and I warn you that anything you may say may be—"

At this point Miss Shane toppled suddenly to the floor. There was just enough room to hold her prostrate body with part of it on several toes. Mr. Culp bent down to help her.

"She is all right," he said. "Just fainted. Let her alone and she will be up in a moment."

They all eagerly looked at the two sheets. The alphabet that Jackson had worked out was as follows:

A 3	G	Fe	M	Q	S	→	
B ⇌	H	=	N	S	T	M _n	X
C K	I	+	O	2	U	o	Y H
D C	J		P		V	G	Z
E FI	K	Br	Q		W	◇	
F Na	L	,	R)			

THE translation of the cryptogram was typewritten out, as follows:

AGAIN I TELL YOU THAT I
CANT STAND YOUR MAKING
LOVE TO THAT DOLL FACED
WIFE OF YOURS. I LOVE YOU.
YOU HAVE SAID YOU LOVE
ME. I WANT YOU FOR MYSELF.
IF I EVER FIND OUT THAT
YOU HAVE BEEN MAKING
LOVE TO HER I SHALL KILL
YOU AND HER BOTH.
YOUR MONOVALENT AFFINITY.

"You see," said the Inspector to Dr. Kane—somehow, over the girl's prostrate body he did not feel like thrusting his interpretation upon Mr. Culp—"how it all happened, now?"

"I—I—am not sure," Dr. Kane replied.

"Well, this wife of his calls him down one night, and he pets her to make up. They walk to the laboratory together, and probably pet a little there, and Miss Shane catches them at it. So she fixes up the poison gas for them. But, accidentally, the wife leaves, and doesn't get the gas."

Dr. Kane was too overcome to speak.

"She got the wrong victim," the Inspector continued. "But it often happens that people who tinker with murder have trouble—"

On the floor beneath them, as they intently discussed the problem, were rustles, and then a click. It was the click of the catch on the door of the lower compartment of the laboratory desk. A bubbling and a faint hiss came up to their ears. Mr. Culp whirled suddenly. To his trained ears the sounds were ominous.

Miss Shane was on hands and knees. The door of the lower compartment

was open, and her hand was extended into it. Within was a Kipp generator, bubbling in full activity. As they looked, amazed and paralyzed, she sank down to the floor in collapse. In an instant they noted the pink of the skin and the blue of the lips.

Mr. Culp caught his breath and held it. He bent over and reached toward the Kipp generator to shut it off, but sank to the floor before he reached it.

Professor Kane comprehended instantly what was going on, and also bent over to shut off the generator, his face blue from holding his breath. He had caught the sweet, penetrating odor of hydrocyanic acid. He fell across Mr. Culp.

In the meantime the Inspector was furiously reaching for his key. He swayed as he pointed it toward the keyhole. Finally he went to the floor without having succeeded in inserting it, adding himself to the heap with the girl at the bottom.

Jackson looked wildly about, like a rat trapped in a poisoned hold. His instinctive action was to take out his whistle and blow a furious blast upon it. But that needed a deep breath, and after the whistle blast, down he went, across the heap of people.

Instantly the door knob rattled and heavy crashes rained on the door. In twenty seconds from the time that the whistle was blown, five forms were dragged out and laid in a row in the corridor, and Dr. North was hurrying back up the stairs. Police officers were pumping at them with artificial respiration and one or two respirators.

Dr. North went down the row and spoke to them.

"The men will be all right in an hour. But the woman is dead. Save yourself any further trouble."

THE END

LANDSCAPES OF LUNA

By BOB OLSEN

Cleaving the void with our rocket tubes blazing
Hurtles our craft on its hazardous race!
First men are we to see sights so amazing —
First of all humans to voyage through space!

Hundreds of thousands of miles from our flyer
Swims Mother Earth in a sable-black sky.
Blazes the sun like a huge ball of fire;
Luna beneath us rolls regally by.

Vistas unfolding: Stupendous! Enthralling!
Sea of Tranquillity: Silvery! Rare!
Clavius' crater: Colossal! Appalling!
Frosted with jewels of crystalized air!

Far to the south loom the Leibnitz and Dorfel
Mountains, their flanks swathed in Stygian night.
Seven miles high thrust those jagged peaks awful —
Gilding their crowns with perpetual light!

Circling the moon, now our ship is returning,
Bearing three homesick, delirious men.
Painfully — madly — for Earth we are yearning.
Lord! We'll be glad when we're back home again!

The Inner Domain

By PHIL COLLAS

Australia has often been termed "The Land that Time Forgot," and to a certain extent this definition is justified. Much of the fauna and flora are of types which may be found only in a fossilized condition in other parts of the world. The aborigines are regarded amongst anthropologists as one of the least developed races of mankind—a survival of the Stone Age—and much doubt exists as to when and how they migrated into the southern continent. In the unexplored jungles of the Kimberley district, in the Far North, relics of a past civilization may yet be found. Central Australia was once a smiling, fertile land, but is now a dessert. What peoples dwelt there and what degree of civilization they had reached, no one knows—the deep, sandy desert holds many secrets.

Prologue

THE Chief Engineer of the Radio Corporation of Australia leaned back with a puzzled frown. The huge aluminum panels, studded with black dials and switches, seemed to revolve themselves into malignant, grinning faces which mocked his vain attempts to solve the great enigma. Yet the Chief Engineer's coldly scientific mind told him that the large receivers were but the medium of expression and that he would have to look further for a solution.

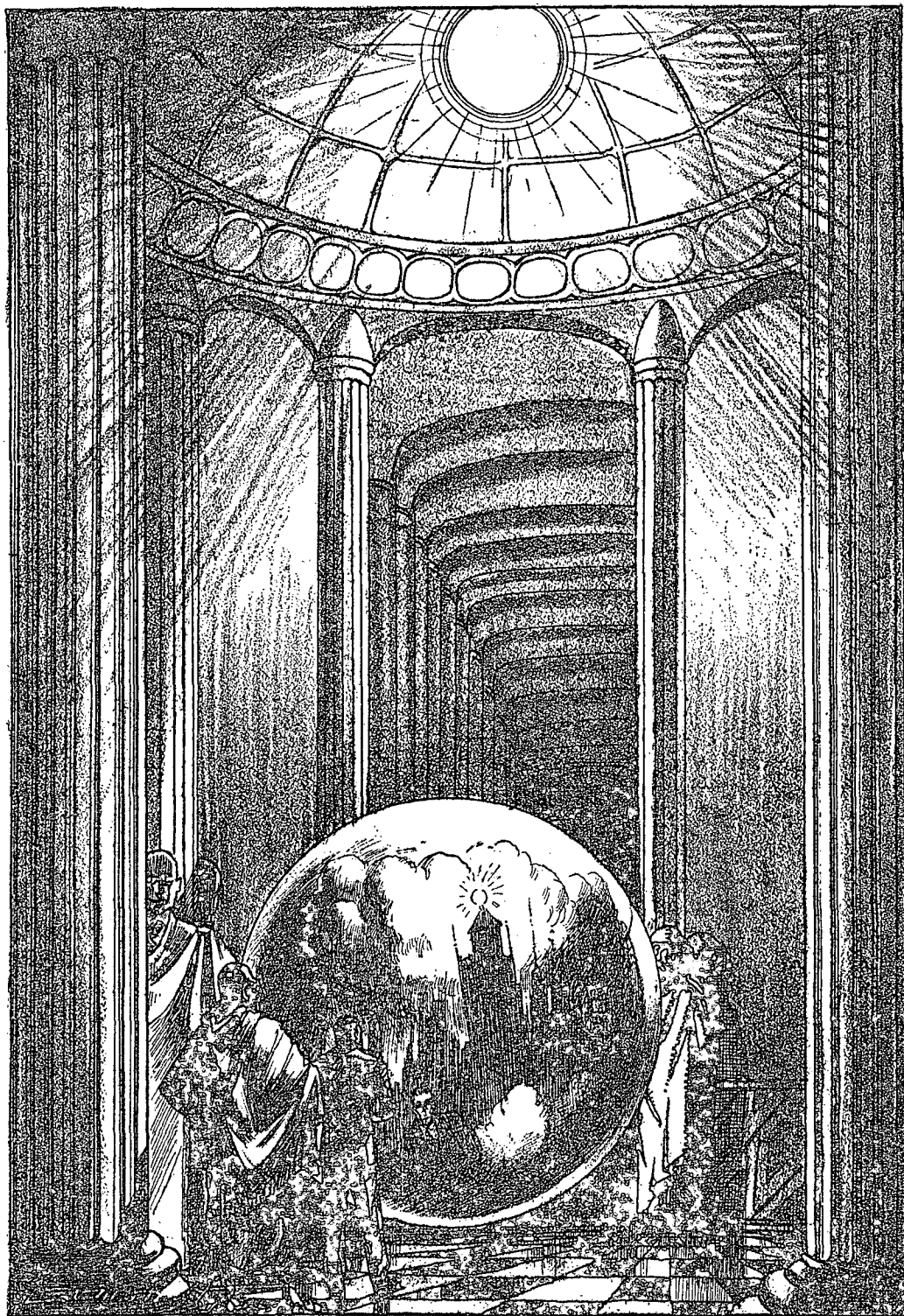
For five weeks past every station on bands between 1500 and 550 kilocycles had been receiving strong signals from an unknown source. They came in at full strength, over fluctuating wavelengths and blocked ordinary reception to a great degree. All over Australia this interference was causing much annoyance to the commercial newscasting companies and to other users of the ether.

Phonographic records of the apparent

messages, taken and then reproduced slowly, were unintelligible and in spite of considerable research on the part of philologists nothing was found to indicate that the broadcasted utterances were in a present-day language, or akin to any tongue known to science. Indeed, the guttural, somewhat animal-like sounds were declared by many scientists to be of purely animal origin and it was suggested that a huge joke was being perpetrated by broadcasting the voice of an ape or other members of simian genus.

A small body of philologists maintained, however, that the messages received were spoken by a rational being, and from the phonographic records kept they proved to their own satisfaction that, because of the similarity of certain sound-groups, the apparent sense of inflection and the general balanced effect of completed sentences, only a human being could be responsible.

The public announcement of this opinion was, appropriately enough, made



This was no ordinary crystal mass, as the engineer immediately perceived, for it partook of the nature of a moving cinematograph screen. Views of many kinds floated in and out. . . .

at a time when news was particularly scarce and both the written and spoken press made the most of the opportunity presented.

The daily papers and newscasters seized upon the problem from all angles. Ridicule and praise were alternately heaped upon the learned scientists who were persuaded to make long statements supporting their views. Much was written of interplanetary communication and budding scientists wrote of the possibilities of life on Venus, Mars and other worlds. All Australia awaited further developments.

The next move came when Professor Henry T. Caldwell, lecturer in ancient and modern languages at the University of Melbourne, after diligent research and study of the phonographic records, definitely stated that the language was human and had its origin on earth and further that it was his considered opinion that it was the tongue of the extinct Arnuna aborigines, who once roamed over Central Australia.

As the last of this race had died some ninety years previously, on the face of it, the Professor's statement was palpably absurd and the press was not slow in saying so, especially as the Professor was alone in his view and could not, or would not show that any spoken records of this extinct language existed. Professor Caldwell's opinion fell upon an incredulous world and stifled interest in what was becoming a lively question.

The Radio Corporation had not been idle in its attempts to locate the source of the unknown broadcasting station. Direction-finders had indicated that the probable location of the transmitter was in Centralia, in the midst of a desert and careful calculation at last fixed a spot some two hundred miles from Kubana in latitude $26^{\circ}40'$ South and longitude $128^{\circ}56'$ East. Four fast planes carrying officials of the Corporation,

members of the Aerial Control Police and two eminent scientists were immediately despatched to this spot, with instructions to silence the unauthorized station and to obtain an explanation as to the intentions of its controllers.

The planes were fitted with short-wave radiophone sets in duplicate and also with extremely sensitive wave-source detectors and audibility meters, these latter instruments being used to locate, measure and permanently record any wave-form between 15,000 and 50 kilocycles. Constant communication was maintained with headquarters as to progress and audibility-meter readings were sent at intervals.

Within four hours the investigating planes had reached the position indicated on their maps. During the past hour the interfering signals had been increasing in intensity until at last the audibility-meter's trembling pointer rested at "half-deflection." It rose no further but oscillated there while the planes cruised over the roughly refined area which the direction finders had mapped out.

For miles in every direction stretched the hard, sun-baked desert, bare and uninviting. There was no sign of human habitation in any direction and nothing broke the monotony of the flat landscape. It seemed to the occupants of the planes, that they were on a forlorn quest, direction-finders, receivers and audibility-meters notwithstanding. Under the fierce sun, the shimmering heat waves danced with a fierce delight and in spite of the motion of the planes the occupants felt unbearably hot.

Meanwhile, at headquarters, the Chief Radio Engineer had been summoned to a conference at which various representatives of the bodies who had controlling interests in the Radio Corporation of Australia were present. Scientists, professors and celebrated radio engineers had also been invited and all listened

eagerly as the reports came through the loudspeaker with a clear-cut crispness which seemed amazing when the thousand miles air-line of separation was considered.

The planes swept around, and separating, spread out to closely examine the country. For some hours they flew at a low altitude over the desert, even going far beyond the suspected area, but all to no purpose. Nothing relieved the monotony of the landscape and there were no signs that human beings had ever sought to establish themselves on such forbidding, waterless territory. The planes were forced to report their failure to the waiting conference and there presently ensued much discussion on the queer circumstances, both of the transmission and the locality of the unknown station.

Then Dr. Munro, a physicist attached to the Radio and Astronomical Station at Mount Kosciuszko, rose to his feet and placed another theory before the gathering. He declared, with conviction, that he was certain that the interference was due to a natural emanation of waves at radio frequency caused by phenomena which, he affirmed, could easily occur in the realms of nature at volcanic centers such as Waikawa, New Zealand, Krakatoa, near Sumatra and Yianyo in Japan.

In other words, subterranean activity, rock grinding against ore, metals coalescing and intermingling with rare elements of the earth had set up an extremely powerful "natural" broadcasting station whose emanations were forced out in every direction. The "ground wave" soon died out but the "sky wave" traveled until it reached the Kennelly-Heavyside layer from which it was reflected, at an angle that redirected the accentuated wave to the spot in Centralia singled out by the direction finders. "To put the position plainly," stated Dr. Munro, "the same series of actions,

which take place in an oscillating crystal detector, has taken place on an infinitely larger scale in Nature."

Dr. Munro's statement created a profound impression and the controversy was reopened by other distinguished members of the conference who strove to prove that this theory was impossible, and for many days afterwards the scientific world had two minds on the whole question.

The signals continued with unabated strength for a further month and then, as suddenly as they had commenced, they ceased. In a few days the inexplicable occurrences had almost faded from people's memories, and with the fleeting weeks another unsolved mystery passed into the limbo of forgotten things. Nothing remained but a despised collection of phonograph records in the vaults of the Radio Corporation of Australia.

END OF PROLOGUE.

SOME three years later, or to be more precise, the twenty-second day of August, 1981, a heavy air plane was droning its way over the southern portion of the Great Sandy Desert, which occupies a large area in Western Australia and extends to the MacDonnell Ranges of the Federal Territory of Centralia. On board the plane were John B. Patterson, president of the Roma United Oil Company, William Langhorn, the Company's Chief Engineer, and Charles Winslow, a nephew of the president and assistant to Langhorn.

The R. U. O. Company had inaugurated oil-drilling on a profitable basis in Australia and held large concessions in the Roma district of North Queensland, but, unfortunately, the flow of oil was diminishing slowly but surely over the whole area, and it was only a question of time when the fields would be worked out.

The three men were in Perth, West Australia, arranging for an aerial prospecting party to explore the Wiluna district, to sink bores and generally to examine the country with a view to opening up new oil fields. Oil-bearing strata were known to exist far underground and the party was to locate, if possible, the runs of the oil-bearing strata. John Patterson and his associates had intended accompanying the party, for they all felt the need of a change away from the tedious routine of their everyday lives, but an urgent radiophone message from the North had caused an immediate alteration of plans.

An R. U. O. prospecting party had struck oil in almost unbelievable quantities some miles from the Northern Territorian town of Boolaloola and advice was urgently required in order to prevent wastage, to quickly develop the field and to place the oil upon a hungry market. A plane was immediately chartered and within half an hour the three men were aboard and the huge Austral monoplane was rushing across the continent to its destination.

"Well," said Patterson, when the men had adjusted themselves and were sitting at ease in the comfortable lounge room, many thousand feet above Mother Earth, "Our holiday has evaporated, but we'll make it up later. If the strike at Boolaloola is anything like what Ryan intimated over the phone, the Company will be in an impregnable position and able to compete successfully in the East.

"Australia is near the great markets of China and Japan and yet we have a heavy adverse trade balance. Their oil is at present obtained from Russian wells, but we should be able to land it cheaper than the Russians with their obsolete methods of transportation. We'll build docks on the McArthur River and will only have to run pipe lines three miles or so. The strike was made in a

good spot and we'll take full advantage of it."

"That's right, Chief," remarked Langhorn. "But have you considered—"

Suddenly the huge airplane swayed violently and lurched sideways, flinging the passengers heavily to the starboard wall. The engines were racing wildly and as the pilot, regaining his feet, leaped towards the controls, they stopped and a dreadful silence, broken only by the wailing of the air sliding past the dropping plane, prevailed. The plane was falling rapidly in a mad spin and the pilot's efforts to open the ship into a glide and to restart the engines were agonizingly futile. Something extraordinary had happened to stop all three engines simultaneously.

The end seemed very near. The pilot wrestled in vain with the controls, while the passengers waited with gritted teeth. Escape was impossible and they awaited the end. The plane spun with tremendous velocity towards the earth. It was only a matter of seconds now. Suddenly it came—the plane seemed to strike the ground with mighty force!

WINSLOW slowly opened his eyes and gazed around but he could see nothing. Stygian blackness enveloped him like a shroud; indeed so intense was the utter darkness, that it seemed to oppress and weigh him down. He remembered the plane falling, but try as he might, he had no recollection of what had happened—whether the pilot had recovered control or whether they had crashed. What *had* happened? But he could not think of a possible solution, and he turned to a consideration of his immediate position.

He felt stiff and sore and one arm was paining considerably. He closed his eyes and vainly sought to wrestle with the problem. It was some minutes before he opened them again, and to his surprise

the darkness was now less intense. The blackness, so strangely oppressive, was withdrawing, and in its place was appearing a soft radiance. Slowly the light grew brighter until Winslow could make out the details of his surroundings.

He was in a large square chamber, apparently hewn from solid rock, for no signs of joints of any description were visible. The walls were absolutely smooth and stretched upwards for a dozen or more feet to the ceiling which, in the soft light, Winslow could see was covered with some sort of a geometrically patterned design. The source of the light puzzled him. The whole room was light and there were no shadows.

The engineer turned to a fresh inspection of himself. He was lying on a kind of couch raised but a few inches above the floor. There were no other articles of furniture in the room and he examined the bed with interest. The material covering it was unlike any with which he was acquainted; indeed it appeared to possess a slight radiance of its own and under his fingers felt warm, like a blanket which had been placed before a radiator.

As the light showed no signs of decreasing in strength Winslow considered it high time to investigate his whereabouts. His left arm was still paining and under the light, for the first time, he noticed that it was bandaged and held in position by a curiously wrought strap, soft and pliable, yet obviously made of metal. This gave fresh grounds for wonder. "Whoever it is," he thought, "someone is apparently looking after me."

He struggled up into a sitting position and looking around noticed an opening in the wall behind him, a little to the right. "Here is a chance to find out something," he muttered and, feeling stiff and sore all over, rose from the couch and stood leaning against the wall.

A sudden fit of nausea almost overcame him, but presently his head cleared and he commenced making his way towards the opening, steadying himself, as he moved, by the support of the wall.

The engineer had progressed but a few paces when he heard shuffling footsteps approaching him. He paused and anxiously waited. "Who could it be?" he wondered. His last recollections of locality was that the plane was somewhere over the Great Sandy Desert, and it was a well-known fact that, under no circumstances, was it possible to live on the barren, waterless plain.

A FIGURE turned through the doorway and the engineer gasped on beholding the visitor. He saw a large, brown man, clad in a robe draped loosely about his body. Of splendid proportions he was almost seven feet in height and his flashing black eyes seemed to pierce through and sear Winslow's very mind. His head was completely devoid of hair and a closer examination showed that he did not possess eyebrows and but very scant lashes. His legs were bare and shoes made of a glittering metallic substance covered his feet. But he was a magnificent specimen of humanity, beside whom Winslow felt small and insignificant.

The man stopped before the amazed engineer and commenced talking and gesturing. He used a strange guttural tongue which however was soft and not unpleasant to hear, but to Winslow it was utterly strange and totally unlike the languages which he knew or had heard spoken. The stranger pointed aloft and then to the engineer's bound arm and Winslow grasped that the brown man was endeavoring to relate what had befallen. He shook his head incomprehensively and spoke in English. The stranger listened intently, but it was plain that he did not understand. The

robed man then changed his tactics and with an unmistakable gesture indicated that Winslow was to accompany him.

The engineer now felt considerably stronger. The sickly mauses had vanished and although his arm was paining somewhat he felt capable of almost anything. The guide led him through the doorless opening and along a wide passage-way which was illuminated by the same invisible lighting as was the room just located.

The queerly assorted pair moved forward at a fair pace. The way was straight and they passed many openings and cross-passages, and the engineer, glancing into the rooms, was surprised to notice that most of them contained machinery, the purpose of which he could not fathom by a casual glance. Many huge machines were working away almost noiselessly and save for a few figures of men who were consulting various dials and regulating a series of wheels set on a panel, there were practically no attendants visible. Some of the rooms were evidently living quarters for a brief glance disclosed inert forms stretched out on couches similar to that which Wilson had not long previously occupied.

"Where was he?" he wondered. "Had the plane miraculously recovered and landed somewhere in that part of Northern Australia which had not yet been explored—a territory which, covered with dense jungle and swarming with poisonous insect life, had defied the penetration of exploring parties and which planes never crossed because of the risk attached to a forced landing hundreds of miles from the nearest point of civilization. The pair had now reached the end of the passage-way and a little thrill of excitement shook the engineer as he passed between the massive pillars which flanked the exit. For he was in another civilization—a new

world—and a very strange world at that!

EVERYTHING was bathed in a soft radiance similar to that which had illuminated the passages, but here the source was apparent. Four thousand or more feet high in the air, a giant crystal ball hung suspended, by what means Winslow could not fathom, and shed a soft, even light in all directions. Further away another shining crystal could be discerned and further distant balls of radiance suggested that these mighty lamps were placed at regular intervals. Remarkably enough, in spite of their close proximity, they shed light only and did not emit heat. This fact Winslow learned later but at the time he did notice that the temperature—a pleasant and moderately warm one—was not appreciatively different from that prevailing in the tunnels.

Immense buildings of a unique and peculiar construction rose upwards, to the very suns apparently, whilst along the great roadways which stretched in every direction, sped many strange vehicles, each of which contained one or more persons who presented the same hairless, yet impressive appearance as his companion.

"WHERE was he?" Strange ideas flitted through his mind, but he could not grasp the magnitude—the wonderful thoughts which they provoked. However, his guide did not allow time for thought or sightseeing, for he was hurried down a slight ramp to the roadway and motioned into a vehicle similar to those which were flashing by.

Winslow glanced at the carriage with interest. About ten feet in length, it was a pure oval in shape, flat like a disc and upon its uppermost surface were arranged two pairs of seats. The carriage was apparently resting on thin air for between the lower side of the oval and

the roadway there was absolutely nothing—no signs of wheels or other supports! Yet the machine was poised in the air, motionless, some eighteen inches from the ground.

The guide left him no time for investigations, for barely had he chosen the rearmost seat on the disc when his companion, manipulating a series of buttons set in a panel along the front of the machine on a kind of dashboard, caused it to move off at a tremendous pace along the great road amongst many similar vehicles, all of which, despite their apparently simple construction, were attaining incredible speeds.

They sped along between high buildings which flanked each side of the street. Built of an almost transparent substance, the like of which was utterly unknown to Winslow, their gleaming walls were colorless, and yet, peculiarly enough, seemed to effuse color of a strange, intangible quality. Many people, replicas of his guide, were hurrying in and out of the vast structures and it was evident that, whatever form their business or occupations might take, they were fully engrossed with their own affairs.

Presently the street widened out until it opened into an immense square which was dominated by a building of truly majestic and imposing appearance. Giant pillars of the translucent material, surmounted by strange and terrifying statues of queerly formed human beings and twined reptiles, supported an immense dome which literally scintillated light and color.

The machine drew up before the huge portico of the domed building and it could be seen that the structure was further supported by an inner wall, upon which great carvings stood out clearly and extended upwards for some twenty feet. Winslow found himself moving up a ramp lined on each side

with further giant statues of the same grotesque figures, whilst between these were small images of a strange animal somewhat resembling a mole.

The line of terrifying shapes came to an end and the engineer and his companion stood before an immense golden door, which, unlike most doors, was absolutely spherical in shape, in fact but a ball of metal. It shone with a kind of subdued radiance and Winslow, placing his injured arm upon its surface, felt that same mild degree of warmth that his couch-covering had possessed.

A SMALL golden ball hung by a chain from the wrought bracket affixed to the adjoining wall, and this his companion touched lightly with the tip of one finger. Almost immediately the great door rolled silently upwards, leaving a clear opening through which they passed.

A moment later Winslow found himself standing in the immense hall which he later found was termed the "Hall of the Living Sphere." Tall and stately pillars of the translucent stone, as the engineer concluded it must be, rose on every side to curve gracefully to the rim of the dome which shone with the soft radiance which seemed to be the most familiar feature of this strange domain. But the most amazing feature of the hall was a huge crystal ball, some twelve feet in diameter, which, occupying a spot immediately below the center of the dome, slowly revolved.

This was no ordinary crystal mass, as the engineer immediately perceived, for it partook of the nature of a moving cinematograph screen. Views of many kinds floated in and out of view—tall buildings gave way to busy street scenes, and the crystal occasionally darkened to show vast, underground labyrinths, along which figures were hastening. Another scene depicted men clustered about a

large machine from which long tongues of flame were issuing and striking a rock-face which melted beneath the rays.

Winslow was fascinated by the wonderful moving scenes, so lifelike that he seemed to be standing in their midst. Suddenly, he became aware that the guide had left him and that three strangers were before him. He glanced up and saw the inscrutable countenances of three old men who carried staffs, upon the tips of which glowed small balls of crystal.

The men, over six feet in height, were singularly impressive in appearance and their bearing was one of authority. They were, like the other members of this people that Winslow had seen, almost completely devoid of hair and clad in long robes reaching to the ground. The most venerable-looking addressed the engineer, but the language was incomprehensible and Winslow shook his head and gestured that he did not understand.

A second then tried in what appeared to be a different tongue but again the engineer was forced to indicate that he could not comprehend. The three then conferred together in low tones and evidently arrived at a decision for the first speaker beckoned, in an unmistakable manner, for Winslow to follow him. He led the way into a small antechamber and, motioning him to be seated, left the room.

The chamber was some fifteen feet square and the heavily draped wall gave the impression that it was sound-proof. A large machine took up considerable space in the center of the room. Of a design absolutely new to the engineer, he could not even guess its purpose and was about to rise and examine it more closely, when two strangers entered carrying large baskets containing machinery parts, wire, tools and other material. Without taking the slightest notice of

Winslow they commenced work on the machine which they partially dismantled and rebuilt in a different form, using the greater part of the apparatus from the baskets. The men worked swiftly and tirelessly and soon completed the task, gathered their tools and spare parts and unobtrusively left the room.

WINSLOW stood up and was again about to approach the machine in an endeavor to gain an inkling of its purpose, when the three counsellors, as he mentally labeled them, entered. They walked up to and carefully examined the machine, afterwards conferring together to reach an apparently satisfactory conclusion.

From an opening in the rear portion of the apparatus, one of the men procured a large helmet, that in some respects resembled the head-piece worn by deep-sea divers. Constructed of a strange metal, it was fashioned to fit over the top of the head down to the bridge of the nose, thus covering the eyes. Two bulb-like projections were placed in close proximity to the ears and from these a series of wires led to different portions of the machine. Winslow was motioned to a seat near this elaborate piece of apparatus and by signs was shown that the helmet was to be placed over his head.

He did not object. In the first place, with his damaged arm, he could have offered little resistance, whilst in the second he considered himself a sufficient judge of character to infer that no harm was intended. The helmet was adjusted over his eyes and he was in complete darkness. A strange throbbing became apparent and he knew that the machine had been set into operation.

Presently a tiny voice was heard, and marvel of marvels, it greeted him in English! "We greet you, O man from afar and welcome you to the land of the

Arnuna." "Hullo," said Winslow foolishly, "How are you? Before you speak further could you possibly inform me of my whereabouts?" "Yes, O stranger, it was with the purpose of communicating with you that we adapted this machine so that it might transmit thought and will. You are in the land of the people of Arnuna and you entered our domain by a strange method.

"Know you that Koonala, the greatest scientist of Arnuna, recently perfected a machine which he claimed could transpose matter at a distance—that is to say—something which is in one place could be transposed elsewhere, and that which occupied the second position would take up the first position.

"And that is what happened to you. After many delicate experiments, Koonala successfully proved that he could, by careful and elaborate calculation, so arrange matters that the transfer was almost instantaneous for short distances and furthermore adjoining objects, not coming under the transposition-influence, were not affected.

"Some interesting experiments along these lines were being conducted by Koonala, but on the last occasion he was called away on other business, leaving the machine in the care of his assistant with strict injunctions to leave the controls alone. The assistant, however, possessed an inquiring nature and desired to experiment himself. He phoned the force upwards, thinking that in this procedure there could be no danger, and set the controls so that a transfer would occur between the Outer and Inner Worlds."

"Outer and Inner Worlds," interrupted Winslow, "But what is the difference?" "Merely my friend, that you of the Outer World are now amongst the Arnuna who dwell within." "What! I am underground, then?" "Yes." "Well, that explains many things."

The voice continued. "But let us proceed in due order. Your questions will be answered later. Koonala's assistant duly manipulated the controls and arranged for the transference of Inner and Outer World atmosphere. But, unfortunately, his knowledge of the machine was not complete and it so happened that a very extraordinary transfer occurred. One of our large workshops, happily at the time vacant, was transposed to the Outer World and the vessel which carried yourself and others, happening to pass over the field of disturbance, was carried to the Inner World, more or less intact. All your companions were killed and it was fortunate that you, yourself, escaped the same fate."

Winslow felt as one stunned. Now he knew what had happened, and the knowledge was all the more terrible because of the extraordinary circumstances surrounding it. He could not bear to hear more and begged of his informant to relieve him of the helmet.

"YES," was the response. "We are aware of the shock you have experienced. It is our desire that you now rest and after a short period we shall, by means of a variation of this instrument, which is merely a means of impressing thought messages, instruct you in our language and customs."

Winslow felt sick and fainting for the bad news had hit him hard and he was barely conscious of the helmet being removed from his head. He had a dim remembrance of being carried from the room and then all became blank.

When he again recovered consciousness he was lying on a couch in a great room, the walls of which were decorated with elaborately designed, geometrical patterns that wound in and out in a truly amazing manner, yet all the time preserving one definite symmetrical de-

sign. The room was almost bare of furnishings, which consisted only of an ornate hexagon-shaped table with six legs, a stool of the same shape and the couch upon which he was resting. He felt considerably better and his arm seemed almost normal albeit slightly stiff.

One of the counsellors now entered the room and proceeded to examine Winslow carefully all over with the practiced skill that indicated considerable medical experience. An exclamation of satisfaction escaped him on the conclusion of the examination and the engineer gathered that the physicist was well satisfied with his progress. He next touched a button set in the wall near the head of the couch and an instant later two assistants appeared in the doorway wheeling in the thought-transmission apparatus. The helmet was again placed over his head and the counsellor spoke.

"You have now almost completely recovered your health and your mental powers are normal. It is the desire of the High Council of Arnuna that you be instructed in such history of the people as will lead you to obtain a clear understanding of our civilization and your position. When the history has been imparted to you by means of this machine, the apparatus will be altered and adapted so that you may be instructed in the Arnunan language. At a later period you will have to appear before the High Council, or its officers, to answer questions concerning the Outer World.

"I now commence the story of the people of Arnuna.

Ages ago, when the world was young, the people of Arnuna dwelt upon the surface of the earth in a land which was rich in all things necessary for a happy and contented existence. The Arnuna were at peace with all neighboring peoples and tilled the soil and killed the beasts of the jungle without hindrance from any.

Then disaster came. A mighty force of fair-skinned metal-clad warriors, worshippers of the Sun-God whom they termed Rah, and who carried metal weapons far superior to our spears of wood, came down like a scourge from the northern land of Mu. They took possession of the country wherein dwelt the Arnuna and other tribes and slew, without mercy, all who opposed their passage or desires.

The Arnuna became slaves and lived but to carry out the commands of the conquerors who arrogantly called themselves 'Children of the Sun.' Our forefathers toiled in deep quarries and mined huge blocks of stone used to build mighty edifices that reached far up into the sky. These were the temples dedicated to Rah, the Sun, the god of the oppressors, whilst the poor Arnunan slaves died in multitudes so that the prestige of the Children of the Sun would be sufficiently established in the eyes of Rah, the Mighty.

The people of Arnuna were brave and many times did they arise and slay numbers of the fair-skinned conquerors, but each time they were overpowered and their lot became even worse. It was during one of these risings that a large number of Arnuna, both men and women, managed to seize several sea-going canoes and escaped into the open sea to travel they knew not whither. The canoes had been well-provisioned for a long voyage to Mu and the Arnuna were fortunate in having the wherewithal to keep themselves alive. They had no plans, no definite desire to go anywhere unless to a place where they would be free from molestation.

After sailing before a strong breeze for some twelve days, land was sighted ahead and they disembarked upon the deserted shores of a great country. Palms of many descriptions grew along the beach line, and beyond the palms

the voyagers could perceive a dense jungle stretching inland. The elders of the expedition held a conference to decide upon a line of action and it was unanimously resolved that the Arnuna should penetrate inland as far as possible, there to make their home, far from the possibilities of pursuit. It was from one, Dak-la, that the best suggestion arose.

"Oh elders of the Arnuna," he cried. "It is well that we travel inland and keep away from the shores of this land, because the Children of the Sun may follow us. But consider what we have to face, forcing a passage through thick jungle. I, myself, have inspected this jungle and it is well-nigh impassable. Here is my suggestion. Allow the men of the tribe to scatter far and wide along the coastline in search of a large river that flows from the in-lands. This we can follow to its limits and thus overcome the obstruction of the jungle."

Dak-la's plan was immediately adopted and the Arnuna were not long in discovering several watercourses, both large and small, coming from the in-lands, but the crowning discovery was made by a tribesman who had ventured much further than any of his companions. "Na," he cried, as he entered the camp, "I have to tell of a strange river—a stream which does not flow from the in-lands to the sea but one which courses strongly from the sea through the jungle into the hinterland—a mighty stream which must travel an immense distance.

It will carry us far from the coast!"

THE Arnuna embarked again and for many days traveled down the stream. They passed through the jungle and wound by towering cliffs that stretched almost to the sky; by burning deserts and flat treeless plains, but the mighty stream never lessened in volume for it was fed from the inexhaustable

ocean. Many fresh-water creeks and streamlets entered the salt river which was fittingly termed 'Lohaloma,' the 'Stream of Life,' by the voyagers. Game of all descriptions was easily obtained from the surrounding country and the Arnuna waxed fat and were well contented. As each favorable spot was reached, many of the tribe wished to end their wanderings and settle but the council of elders ruled otherwise. "The Arnuna must go on until the goal was reached and that goal is at the end of the Lohaloma," they declared, and the journey proceeded.

At length the pilgrimage ended; the promised land had been reached! The small fleet of canoes swept around a turn and at once an exclamation of delight escaped all. For before their eyes—the stream merged into an immense body of water. As far as one could see there seemed to be nothing but water. Near at hand the shores were visible, where the water entered, but they rapidly faded beyond the horizon.

Gaily plumaged water-fowl swam in every direction and signs of animal life were not wanting amongst the thick forests which came down almost to the water's edge. Everything necessary for their simple lives seem to be in abundance and after a little searching a natural clearing, through which flowed a small creek, was selected as the site for the camp. The Arnuna disembarked and set about preparing for a new existence, far from their old associations.

We will now skip through history until the time of the "Great Discovery." During the rainy season the huge lake, as it was later discovered to be, fed both from the sea and by numerous streams, was very full. Over a certain level, however, the waters never rose and it had not taken enterprising tribesmen long to discover that the overflow passed down an enormous hole situated

at the lower end of the lake. In the dry season water did not flow and curious canoemen, passing near the opening, saw a great cavern seemingly reaching into the bowels of the earth. Land parties had, at various times, timorously sought to explore the huge tunnel which, ever descending, appeared to be without end, but they had never ventured very far and learned nothing except that it was of enormous extent and occupied by strange winged creatures which were of little use for food.

One day, when the rainy season was at its height, a canoe-load of young men, sailing perilously close to the hole, was caught in the fierce current, and in spite of strenuous efforts could not force their craft into safer waters. The last that occupants of distant vessels saw was the canoe disappearing from sight down the 'Hole to the Bottom of the World.' This was the end, thought the watchers, and they sped shorewards to convey the sad tidings and the people rendered the usual ceremonies in honor of the dead.

TWO wet seasons had come and gone and it was again the time when the water ceased to flow down the hole. Some little time after the cessation a solitary hunter was alarmed and surprised when an apparent stranger, clad in quaint garments, hailed him and requested to be directed by the shortest way to Dak-la, the then ruler of the Arnuna and lineal descendant of the ancient Dak-la who had long ago suggested how they should leave the coast by means of a river. The laws of Arnuna, then as now, allow people, whatever their station, to claim an audience at certain specified times with their ruler and Dak-la, in granting an audience to one who had merely announced his name as Yagi, a not uncommon cognomen, had not thought that by so doing the destiny of his people was to change.

The man entered and greeted Dak-la in the customary manner. "I am Yagi," he said, "one of the six men who were carried down the 'Hole to the Bottom of the World,' at the time of the second wet season past."

Dak-la gasped and felt as if an icy hand had reached out and clutched his throat. A spirit from the Kingdom of the Dead was before him and he knew not what it portended. But Yagi broke the suspense. "I am not a ghost," he said. "I am as alive and as well as you are. If you would but summon my relatives they will, I am sure, vouch that I am indeed Yagi, and I shall then tell of our wondrous adventures."

We shall pass over the joy of Yagi's friends and relations and tell the amazing story of the man who returned from the 'Hole to the Bottom of the World.' Yagi spoke with a clear and convincing voice.

"When the canoe was caught in the torrent we fought desperately to get beyond its influence, but to no avail and before we actually realized what had happened had been drawn on and into the great black opening. As can be imagined, we were terribly afraid and for a long time crouched down below the level of the bulwarks, expecting at any moment to be dashed to pieces. But nothing happened. The canoe was borne along by the flowing waters swiftly and silently. Utter darkness prevailed and even though we extended the paddles as far as possible we could not touch either the sides or roof of the tunnel.

Confidence was returning slowly and we eagerly debated the chances of escaping from our dreadful predicament. If the tunnel suddenly narrowed or rocks protruded above the surface, we might be wrecked; if we continued as we were going we might be forever lost in the bowels of the earth.

The time passed; there was no change

in the situation, except that we were being carried further and further along the underground stream. We had been, according to our reckoning, a day in the canoe, when disaster overtook us. The canoe took a sudden lurch and darted forward at a greatly increased speed. We huddled down, scarcely breathing, whilst our craft sped down the sharply inclined slope. We were conscious of falling rapidly and a deafening roar of water smote our ears. Then suddenly the canoe sloped sideways and in the pitch-darkness we were precipitated into the howling waters. "It is the end," I thought.

But by a miracle we were not to die. Our six forms, shooting from the canoe, fell into the water far below. We were in a familiar element for since childhood we had been as fishes in the water. Everything was in absolute darkness and we were carried some distance along the stream. By dint of much shouting, which seemed but a whisper above the roar of the water, we somehow managed to keep together and miraculously found shelter on a ledge, which jutted out from what we imagined was the shore.

WE huddled together—the six of us—and discussed our situation with voices filled with fear. Were we doomed to die in the blackness of the underworld? For better safety we had worked further along the ledge which evidently extended a considerable distance. The thundering torrent made speech somewhat difficult and we soon lapsed into silence. Our minds and bodies were alike weary and I sank into a troubled slumber, in which great demon creatures with huge circular eyes pursued a canoe that contained six grinning skeletons.

I awoke with a start to hear Yaska, the youngest member of our group, whispering in my ear. "I think I can

see light," he said, "but my mind may be going and I want to be sure," he continued plaintively. "Place your head on the ground and look to the right."

Sure enough a very faint illumination was visible, as if light of some description was being reflected from a great distance. I cried aloud in my excitement, awakening the remainder of the group and we imported this cheering information—a ray of hope in more senses than one. Eagerly springing to our feet we felt our way along the ledge until we arrived at a rock-wall, and in this we felt the outlines of an opening of some sort and it was from this opening the faint luminescence was coming.

We progressed along the tunnel, as it was found to be, and the illumination became brighter and we were able to see, without difficulty, the details of our surroundings. The passage was wide enough for two abreast and about double a man's height. The walls were of stone and the general appearance suggested that the tunnel had been worn out by the action of the water. We rounded a turn and the source of the illumination became visible. Situated in the passage, which here widened considerably, was a structure about half the height of a man and upon this rested a glittering ball of light that was so powerful as to dazzle our weakened eyes. We stopped in amazement. Who could have erected it, for it was obviously the work of men?

We fell to discussing the problem but our conjectures led nowhere. "Well," said Yeska cheerfully, "There is only one thing to do. We must go on. Somewhere in this underground region there must be beings such as we. Only such as they could have placed the light. We must go on until we find them." So we passed around the light and continued the journey. We had not gone a great distance when another light came into

view, affixed as was the first, upon the top of a pillar and set in the middle of the way. As we advanced, these pillars became more numerous until we finally entered a huge hall which literally scintillated light from every portion of its large area.

All was silent in the hall of light. Not a sign of moving creature did we see. The room was, with the exception of a few large blocks of stone arranged around in a circle, completely empty. Again we stopped to confer. We had light but our bodies needed food. Surely there must be an organized intelligence who had placed these lights? Thus we reasoned, and being desperate, were not afraid of what might happen. We crossed the hall and upon the other side saw another entrance to a tunnel similar to the once we had recently left.

To make the story short I shall not discuss our journey through endless passages. It is sufficient to state that we at last emerged from a tunnel into a great open space.

Imagine, if you can, coming from a hole in a mountainside out to a large plain which stretched to the horizon in ever direction except immediately behind us. Imagine further that this plain was situated far below the surface of the earth and even then you could have little conception of what was actually our experience, it was amazing, almost beyond belief, yet this is what occurred.

WE emerged from an underground mountainside or wall of rock into an enormous open space, so large that its boundaries were not visible under the light which was almost as brilliant as our sun of the outside world. We were on a roadway that skirted a large river. Trees and plants of strange and weird form grew abundantly on every hand and small animals, the like of which were entirely unfamiliar, scurried in and

out of the thick, impenetrable underbrush.

But the most uncanny feature of this subterranean world was the remarkable stillness. No birds twittered; wind did not stir the branches of the trees, and save for the rustlings of the small animals, no sound broke the quietness. We were hungry and thirsty, so, casting discretion aside, we plucked and ate greedily of small blue berries which grew in profusion on surrounding bushes and drank the sweet cool waters of the stream that, strangely enough, was not salty.

With renewed vigor and hope we continued our explorations and followed the great road which bore no signs of having been used for a long time as large trees were growing on it in many places. To the right appeared land which had at one time been cultivated, for the regular lay of the ground suggested fallow. We were in a peculiar position, far underground, yet our present surroundings, in some remarkable way, reminded us of the great land beyond the lake, where we had spent so many happy days.

Presently a cluster of buildings came in sight and we eagerly moved towards them. Built of stone, they were astoundingly strong in appearance. Each building was circular in shape and the whole group was set in a circle, each building joined by a massive stone wall which was found to be hollow, thus allowing persons to pass from one to the other.

On arriving at an entrance we had let forth a cry, but there was no answer and the sound echoed from building to building, finally dying away, to be replaced by the dreadful stillness that seemed a feature of this place. A round opening beckoned us and with a feeling of dread, and keeping close together, we passed into one of the circular structures.

Dust, dust, everywhere! It rose in clouds as we stumbled about in the semi-

gloom and descending covered us with a thin film. Pieces of metal, made into queer and wonderful forms, occupied much space but these objects were likewise covered with dust and had not been used for many moons. We searched everywhere for traces of food but could discover nothing of an edible nature. It was very evident that a long time must have elapsed since the towers had been inhabited and we were glad to make an exit. The journey continued along the road and we entered a number of other buildings, but everywhere was the same deserted appearance and no signs of human life.

We spent many days travelling slowly and subsisting on the blue berries fortunately growing in plenty near the roadway, and on the ninth day we found ourselves in the heart of a wonderful city—a dead city—deserted by its once thriving population.

It was a city such as you could not imagine without beholding. Buildings of immense size and of marvelous beauty flanked huge streets, along which multitudes must have once trodden. Strange metal vehicles, as we guessed them to be, were very much in evidence, lying haphazardly where their owners had left them. And in all the great city there was no form of human life. We alone were the visible representatives of the human race.

PERHAPS the most marvelous feature of this underground world was the fact that it was light and the light compared favorably with that given by our sun. Far, far up in the sky we perceived many huge glowing balls of light, evidently similar in construction to the other types of small crystal lights we had seen, and these lit the city and the whole of the surrounding country. In addition, light-balls were set in buildings and in streets which might not

obtain the full benefit of the sky-lights from above.

We made marvelous and stupendous discoveries which would have to be seen to be believed, but from our point of view, the best discovery was that of food. Our curiosity had been aroused by a group of low squat buildings each closed by a heavy circular door. After many attempts we found out how these doors were operated and judge of our surprise, on entering one of the buildings, to see that the first one was literally crammed with food—enough to keep the Arnuna in luxury for a very long period.

Large bins and metal boxes were filled with different kinds of grains, berries and fruits, all in a perfect state of preservation, shelves were stacked high with enormous slabs of a substance, similar in appearance to our taro-root bread, but infinitely better in flavor; piles of sealed caskets, made of a shining metal, contained other varieties of food and large metal casks were found, on investigation, to hold different kinds of sweet liquors. Several other storerooms were also discovered to be packed with food, and another contained clothing, some of which I now wear.

This opportune discovery raised our hopes considerably and with renewed vigor we set out to explore further this wonderful city. We spent many moons in the astounding underground domain, and at every turn were confronted with new and marvelous things—with elaborately wrought metal appliances, wonderful structures, ingenious lighting effects which apparently, once fixed by the original inhabitants, remained functioning perpetually, and other objects whose purpose we could not guess. But nowhere did we find a living human being nor could any human remains be discovered. It was truly a mystery how

and where a whole people could have vanished to.

By this time we had become sorely wearied of the great loneliness and longed to see again the cheery faces of our people but the idea of return seemed very remote. We still had vivid memories of the dreadful journey down the black tunnel, and it was clearly impossible, even if we were to reach the underground stream, to make our way back again.

It was in this extremity that inspiration came to me. I remembered that, for a considerable period of the dry season, water ceased to flow and that consequently the tunnel would be dry. Here was an opportunity to return and eagerly we debated the pros and cons of the project. A plan of action was decided upon and we commenced preparations.

Depots of food were established all along the route through the tunnels right to the waterfall, not now flowing, and at this point an especially large food-supply was accumulated. The work meant many weary journeys from the storerooms, but we accomplished them by dint of hard labor and the assistance of some small wheeled carriages which we found. These proved ideal for transportation purposes and considerably lightened the work.

AS YOU may remember, the tunnel in the vicinity of the waterfall was not lighted and we provided illumination by breaking off a number of the light-crystals from the large hall and affixing them at intervals along the tunnel and on the shelf of rock upon which we had landed and which led right to the foot of the waterfall.

With the food problem solved we made the ledge our temporary headquarters and set to work at the difficult problem of scaling the great height

to the opening far above, down from which we had plunged that fatal day. With the aid of a number of metal tubes we had brought from the city, we built a series of ladders, and after endless failures, managed, by working from ledge to ledge, to reach the top of the cliff and the entrance to the upper tunnel that led back to our home. We now felt that victory was within our grasp. The ladders were so affixed that the full pressure of the water would not strike them and we were confident that they would easily withstand several wet seasons and the consequent floods down the upper tunnel.

This enormous task occupied a very long time and we had just finished placing the last ladder in position when a faint trickle of water warned us that the great stream would soon commence flowing again so we retreated back to the city, there to wait for the next dry season when a serious attempt would be made to reach the upper world again.

During the sojourn in the city we were not idle. We explored it thoroughly and discovered some more food storerooms. We made many journeys to the waterfall and watched the great torrent from which we were lucky to escape with our lives. At last the stream showed signs of abating and we cast lots to see who would make the dash up the tunnel into the world again. It was considered that only one should make the attempt, as it would be a strenuous journey and there was no guarantee that it would be free from danger.

I was fortunately chosen as the messenger and even before the upper tunnel was completely dry I had everything in readiness. I chose food that was light in weight, yet very sustaining, suspended in a cloth bag across my shoulders. For drink I depended on a metal

casket filled with a dark-colored liquid, a few drops of which quenched one's thirst. In my hand I carried a crystal of light and by my side hung a sharp metal bar. Thus equipped, I bid farewell to my companions, who proposed to remain by the waterfall until my return, and I dared the steep upward climb.

I shall not enter into details concerning the difficulties and dangers encountered during the long wearisome journey. It is sufficient that I am here before you now.

Oh, people of Arnuna, a wonderful future lies ahead if you can but take advantage of the knowledge the underground domain holds. There are many wise men amongst us. They can surely solve the mysteries that the city contains.

"And that is the story of the first discovery of the Inner World, told in the actual words of Yagi, as inscribed on ancient manuscript," continued the soft voice of the counsellor.

I shall pass over the immediately succeeding period during which the Arnuna thoroughly explored the Underground Domain and the wise men were gaining some little understanding of its many marvels.

Through the ages geological changes were occurring in the Outer World. The great Lohaloma from the sea had ceased to flow and nearly all other streams which had once entered the lake dried up or lost themselves in the sands.

OUR lake shrank year by year; animal life became very scarce and it was difficult to live upon the surface. A great council of the people was held and it was proposed that the Arnuna should leave their home and travel down to the great inner world city, there to take up permanent residence.

Most of the tribe supported this proposal but a section, led by Beelim, re-

fused to do this, and a breakaway occurred. With their goods and chattels the followers of Beelim departed and crossed the desert, going we knew not whither, whilst the balance of the tribe passed down the huge shaft to our underground shelter.

Shortly after the migration had been completed great rumblings were heard in the earth and we were afraid that the roof of our subterranean home was about to collapse upon us. This did not happen but it was found that great masses of rock had fallen and blocked the passage to the Upper World, which we were nevermore to see again.

The migration occurred many ages ago and since that time the Arnuna have progressed far along the path of knowledge. Gradually we learned all that was known to our predecessors—the secrets and powers of the spheres of light; the method of extracting metal ore from rock by fusion and attraction; how to create the translucent metal from which our buildings and many other things are made—in short, everything the original inhabitants knew. We have gone further and invented machines which can read men's thoughts and transmit them for long distance and our learned men are even now working on a machine that will eliminate time. By it we shall be able to see far into the future and away back into the past.

I shall leave you now and you shall sleep. When you again awake the apparatus to educate you into our language and customs will be ready and you shall learn much in a short time. For the present, sleep!"

Winslow was barely conscious of the helmet being removed. He felt terribly tired and weary and almost instantly dropped into a sound slumber from which he did not awake for many hours.

THE engineer awoke. An attendant stood by his couch and indicated by signs that he was to partake of food that was set out on the wrought metal table by his side. The food possessed a strange yet delightful flavor, and when he had eaten and drunk of the wonderful liquor which seemed to be the elixir of life itself, he felt prepared for anything and eagerly awaited the coming of the machine which was to induct him further into the mysteries of this strange people, living far below the surface of the earth.

The machine presently arrived, in outward appearance being similar to the thought-machine with which he had had experience. The helmet was adjusted over his head—his education was about to commence. For a few moments nothing happened and then, in an instant, an indescribable confusion became impressed on his brain. Presently his mind cleared and there seemed to float before his eyes graphic word-pictures which definitely showed the structure and use of the Arnunan language.

Rapidly the pictures changed and he was led through all the phases of the tongue until he was seeing elaborately formed scientific words, as pictures, before him. He was reading a treatise on the purpose of the thought-machine and then was answering a question in the Arnunan language. Everything seemed to be occurring with bewildering rapidity, yet he was quite conscious of and understood everything. A voice broke in, speaking Arnunan, and he found that he could understand it perfectly. The voice spoke swiftly and clearly and Winslow listened with close attention to the remarkably concise and clear description of the social conditions and government of the people and felt as if he was listening to an ordinary conversation in English, so clear and impressive was the voice.

The discourse ended and his helmet was removed. Winslow, to test his newly acquired knowledge, immediately questioned the surrounding Arnuna in their own language, and somewhat to his surprise, for he had not altogether trusted the power of the machine, found himself understanding every reply with perfect ease. There was still much that he wanted to know and his listeners were often hard put to satisfy his somewhat strange questions.

Two of the counsellors whom he had first met in the Hall of the Living Sphere presently entered and joined the third who had been in charge of the memory-machine. The three conferred for a moment and then walked slowly towards the man from the Outer World. The tallest of the trio introduced himself. "My name is Alakla-la," he said, "This is Wandra-Uli," pointing to his companion, "Whilst our associate who so kindly conducted the education course is Noonni-Am."

The engineer greeted each in turn and then said, "My name is Charles Winslow and by occupation I am a mining engineer." He did not actually use the latter phrase but the Arnunan words which meant "one who studies the rocks." The three men started somewhat at the last remark and regarded him with fresh interest.

The conversation was maintained easily. All had much to say and Winslow was astounded at the great knowledge, spread over many different fields, possessed by the Arnunan scientists. They had progressed far in many subjects, some of which were very much neglected on earth, yet, on the other hand, there were certain elementary facts relating to kindred sciences and to petrology of which they knew nothing. But until he had reason to consider this amazing progress in one direction and neglect in another. Winslow forebore to

mention the matter which might be well explained, when he had time to see the vast Arnunan domain, its resources and geological formation.

He addressed himself to Alakla-la and asked this personage what was to be his fate. The scientist thought for a moment, and then said, "As you have been told, every Arnunan, unless he be prevented by sickness or infirmity, must work, and from my analysis of your character I am sure that you will be prepared to follow a suitable occupation. If you will now accompany me we shall endeavour to provide a task commensurable with your abilities. You will also have every opportunity to see all parts of the Domain as you will have much leisure time."

The pair walked from the room, through the hall of the Living Sphere and down to the roadway, where one of the queer discs-cars was waiting. Winslow had learned that these vehicles were propelled by utilizing the repulsion-property of the metal from which the cars were made and the attraction-property of another metal that was used to surface all roadways throughout the Domain, but actually how this was accomplished he did not yet know.

THEY entered the disc-car which started off at the usual paralyzing speed and whirled along the broad thoroughfare. Between the tall buildings which flanked the road the car sped at increasing speed. Overhead the huge glowing spheres shed their even and never-changing light. The inhabitants of the city thronged the sidewalks and filled the roadway with their cars but his guide did not stop to point out these things.

Presently they left the city area and sped by large, squat buildings from which faintly rose the hum of machinery. Then came a large stretch of

barren ground and passing this the car swerved to the right and entered a huge tunnel, lit by means of small crystals. Many other tunnels branched into this and Alakla-la directed the machine into one of these, along which it flew at a somewhat lessened pace. Presently it slowed down and stopped and the pair alighted.

Alakla-la led Winslow through a doorway and into a vast room which was fitted up in a truly lavish manner as a laboratory. Test tubes, queerly constructed retorts and pieces of machinery and apparatus were everywhere in evidence. Large diagrams covered a portion of the walls and a huge furnace took up considerable space in the center of the room. An old man, busily engaged in drawing strange hieroglyphics on a circular chart, looked up as they approached and greeted them with a courteous smile.

Alakla-la responded and added, "Allow me to introduce Sharl-Winsloo, a man of the Outer World. You already know of his arrival and allocation." The man nodded and addressed Winslow. "My name is Coul-Vani and I have asked that you be sent to me so that if possible you may be of assistance. You are aware, of course, how you entered the Inner World. I can only say that at present there is no hope of your returning for such an experiment will not be conducted until the possibility of failure is eliminated. As the Arnuna insist that all must work for their needs, you were allocated to my laboratory. I heard that you have a knowledge of geology and rock-formations. As a scientist, these constitute my special study and probably you will be able to assist me to a considerable extent."

Coul-Vani's words both alarmed and pleased Winslow. Gone was his every hope of returning to the Upper World and he had now to consider that his

destiny was bound up with the Arnuna. He was pleased, however, that his work was to assist a scientist who specialized in a subject of which he claimed to have a fair knowledge. He briefly thanked the two scientists for their consideration and Coul-vani instructed an attendant to direct him to his quarters which were not far distant.

For some months Winslow worked in the laboratory. The whole system was at first completely strange to him, but as he grasped the methods of Coul-Vani he was frequently able to suggest improvements and to supplement deductions from his own experience. He learned much from the aged scientist, whose knowledge was most profound, especially in regard to the treatment of rocks—their dissolution into the component elements and their reassembling into different forms.

Most of the metals and many synthetic materials were obtained by the disintegration of rock structures, and Winslow's work in the main consisted of experimentation towards achieving better or improved results. With more than adequate equipment at his disposal he found the work intensely interesting and he made a number of small discoveries of some value, for which he was commended by his chief.

WINSLOW had been in the Inner World for almost five months when an event of paramount importance occurred. A great summons went forth to all scientists to assemble and behold the tests of the machine which would eliminate the effects of time. The proceedings were to be held in the Hall of the Living Sphere and the crystal itself was to be the screen upon which past and future events were to be portrayed.

Coul-Vani asked Winslow to accompany him and soon they were in a disc-

car speeding towards the rendezvous. Here was assembled a large concourse of learned Arnunans, all eagerly discussing the possibilities of a machine which could resolve the past and future into terms of the present. Winslow was introduced to many of the scientists, all of whom were interested in the method by which he had entered the Inner World. They asked numerous questions concerning the world outside and he answered them to the best of his ability. He received invitations to visit each of them in their laboratories and he registered a mental vow to do so. Who knew but that it might be possible, with the whole of the science of the Arnuna at his disposal, to find a means of communicating with the Outer World and Home?

Suddenly all was hushed and the lights of the hall dimmed and faded out. The great test was about to commence. The dim outlines of the machine could be seen and a faint hum became apparent. The huge crystal alone illuminated the room slightly, as if it were lit by an inner fire. Presently it glowed with more vigor, then a haze crept over its mirror surface. The scientist operating the machine twisted several dials and then gently pulled a long lever. Immediately the haze vanished, to be replaced by a picture, clear and distinct, of the central portion of the city. Everything seemed to be normal, then a gasp arose.

A number of scientists had recognized certain features which were not now in existence and they realized that they were gazing on a scene which depicted the city as it actually was some time previously. The picture changed and time had flown back for a very long period. The city had shrunk to smaller proportions and Winslow realized that many ages had elapsed since it was as portrayed. Strange wheeled vehicles,

quite unlike the flying discs of the present age, moved along the streets.

Rapidly the scenes changed, each one taking the amazed audience further and further into the past. At length there came a scene depicting the first arrival of the people of Arnuna into the Inner World. Winslow gazed at the ancestors of the persons now grouped around him with peculiar interest. He noticed their remarkable resemblance to aborigines such as he knew them; the typical walk, body markings, weapons and dress could be reproduced by scattered tribes of Australian natives to-day. Gins carried squalling babies and the young lubras crowded together, giggling foolishly. It was a perfect exposition of a typical aboriginal tribe on the move.

THE assembled scientists viewed each scene with profound interest. Many were taking copious notes in their queer hieroglyphic script, the medical men in particular devoting much space to opinions of their ancestors. The mirrored screen became blank; then a new picture flashed into being. The spectators saw the arrival of the first Arnunans, the six who had, long ages before, vanished down the "Hole to the Bottom of the World." The audience watched them move from place to place, seeking for human beings and finding none. They saw them discover the granaries of the vanished people and they saw them making preparations for a return to their tribe.

The scene vanished and the spectators looked upon a deserted city. Nowhere was there any signs of life. The buildings alone stood, mute evidence of a civilization that had ceased to be. The grouped scientists stirred and whispered amongst themselves. Were they to now solve the riddle of the ages—the mystery of the vanished race, their immediate predecessors who had disappeared leav-

ing no reason therefore; leaving not a paper, a book or a carving which might throw some light on a truly astounding event.

The machine purred softly and the operator twisted the dials strongly. The scientists looked out upon a new world. The buildings stood as before, but the whole city was different. Now it was full of activity and life. Human forms moved in every direction, in and out of buildings and along the streets in long queer vehicles. Everyone seemed fully engrossed with his own affairs or the business of the community. Strange people were these predecessors of the Arnuna. About five feet in height, they were clad in gorgeous raiment. Their heads were large, much out of proportion to the thin, almost stalklike bodies beneath them. Long slender arms almost reached the ground whilst huge ears protruded from hairless heads. Yet, for all their oddities, these people were humans and Winslow and the assembled scientists studied them with particular interest. Was the great mystery to be revealed, the mystery of their absolute disappearance? The scientists were busy writing in their queer script and discussing the matter in hushed tones.

PRESENTLY the picture changed and the watchers realized that they were being taken into the future—the future of these strange human beings who had built up a vast subterranean civilization. Like a motion picture the scenes changed, always moving forward, and Winslow followed with keen interest, the efforts and advances of the people.

Then suddenly a mist arose and blotted out the scene. It presently disappeared and an amazing sight was revealed. Strange creatures were moving along the city streets. Huge, shapeless

masses of a jelly-like appearance they were. From a more or less round body eight waving tentacles protruded and with the aid of these the creatures were bounding over the ground with quick undulating movements. That they were a dangerous menace to the inhabitants was very apparent, for weapons of all kinds were being used in a desperate attempt to prevent their advance.

Large machines directed a stabbing ray towards the invaders and holes were literally burnt through and through many of the monsters. Still they came on, apparently little the worse for a few holes. Then great bombs were cast amongst them and these burst with destructive effect, blowing many of the creatures into small pieces. But the supply of bombs was evidently very limited, for it was only at long intervals that they were projected.

The monsters were now in the heart of the city. Every now and then one of them would suddenly dart to one side and, extending a tentacle, grasp an unfortunate inhabitant. The creature would then convey its squirming victim into a great maw of a mouth and so clear was the picture and so transparent the bodies of the jelly-creatures that the horrified scientists could distinctly see the process of digestion being performed. It was an awful sight and one that would linger long in memory.

The grim invaders rapidly advanced, entering building after building, and devouring all whom they encountered. The puny weapons of the people had long ceased to function, for their crews had fallen victims to the quivering monsters. The scenes changed slowly and at last it was seen that the invaders alone existed in the city. They had spread in every direction seeking food, and so great were their numbers that all food not stored away in impregnable chambers must soon be devoured.

A new picture appeared on the giant crystal. The jellylike monsters were now skulking in and behind buildings. Every now and then two would meet, a mortal combat would ensue and the victor would finish the struggle very decisively by devouring the body of the vanquished.

Thus had the time-machine revealed the past and the great mystery that had long baffled investigation was solved. The city alone had remained, a mute testimony to a vanished people and an inspiration to a race that was to come.

THE purring of the time-machine ceased and an unnatural silence ensued, to be broken by the calm voice of the scientist who had manipulated the controls. "The past had been revealed, as you all have seen, and I trust that you have learned much. Later, I propose to delve into the future—the future of our people, but before this can be done I must make certain alterations to the machine. What has existed is still in existence and may be revealed by certain processes, but to the future this does not apply, and different methods must be used. For the present I leave you," and with a word of farewell he vanished into an anteroom.

The assembled scientists crowded together and eagerly and excitingly discussed the possibilities and potentialities that had been revealed by the pictures of the past and, somewhat to his surprise, Winslow found himself joining eagerly in the discussions. He had wandered away from Coul-Vani, and was debating the standard of civilization of the first inhabitants of the city with an earnest young man about his own age. A few chance words dropped by his *vis à vis*, who had said his name was Iala-Vam, however, had directed the conversation into another channel, and Winslow became suddenly anxious to con-

tinue the discussion along the new lines.

Iala-Vam had just said, "I wonder if their system of distant communication worked as satisfactorily as ours." Winslow started suddenly. "The Arnuna have a system of distant communication, then," he thought. "But how is it that I have heard nothing of it?" He then remembered that when he was receiving the education course a slight reference had been made to this subject, but at the time he had not given a thought as to what the statement implied.

He questioned Iala-Vam concerning the operation of the system and the young scientist endeavoured to explain. The technical description was, however, somewhat involved and difficult to follow, so, in order that Winslow might understand the theory and operation of the communication set thoroughly, Iala-Vam invited him to call at his laboratories and see the machine in operation.

Several days later, Winslow climbed into a disc-car, which he could now operate successfully, and whirled through the long tunnels. He stopped the vehicle opposite Iala-Vam's experimenting chamber and entered. Iala-Vam greeted him cordially and without any preliminaries at once entered into a discussion of his special work—distance communication. "As you know," he said, "sound and light travel at certain definite speeds. Both can be diverted and reflected from a straight course and, by the use of certain mechanical devices, sound and light may be controlled and amplified and made use of for many different purposes.

"For many ages the Arnuna have been able to communicate by the use of certain instruments to all parts of the Inner World and our apparatus has now reached such perfection that one can both see and hear all that is going on elsewhere, although strangely enough,

the people take but little advantage of these facilities. You have seen the great crystal sphere. It can be so controlled that any part of the Domain can be seen, but it has not the attachment which allows one to both hear and see. Our instruments had reached a standard upon which it was impossible to improve, and, with little to do, the idea came to me that we might be able to communicate with the Outer World which we knew must be still populated.

"Occasionally faint signals which we could not understand came in on the receivers and by a mere amplification we were enabled to listen to them clearly. The language used was strange and not understandable, but we were able to appreciate the music which, although different from our form, was yet delightful. These indications showed that the residents of the Outer World knew of distant communication and we resolved to let them hear a voice from the Inner World.

"By means of a neutralizer we eliminated the resistance of the great thickness of rock which lies between the Inner and Outer Worlds and, at regular intervals for a lengthy period, I and my confreres spoke of the Domain. We scarcely hoped that we should be at first understood but we considered that the intelligence of the Outer World would be such that there would be slight difficulty in recording and interpreting our speeches and then replying. But we obtained no response to the powerful messages and could only conclude that the beings of the Outer World could or would not understand them. Thus ended our attempts to communicate with another people and disheartened we dismantled the apparatus and commenced working on another theory.

"We have known for many ages that

the Outer World was inhabited and we believed that we were the only dwellers beneath the surface. But our domain is not of exceptional size, and it is quite possible that other peoples also live below the crust. Several of our scientists believe that this is the case, and we now seek to communicate with these by means of instruments which will transmit impulses through the rock."

Winslow listened with startled wonder. At last there was a chance of establishing a connection with the world he had unwillingly left! He explained rapidly to Iala-Vam the great strides that radio had made in the Outer World during the last few years. He spoke of television and distant control of aircraft and machinery; of the experiments which were being made in connection with the transmission of power through the air.

"Oh, Iala-Vam," he said, "allow me the opportunity of getting in touch with the Outer World. It means everything to me. I shall never leave your country and my people may never penetrate the vast thickness of rock which lies between us, but our two peoples may learn much from each other. No race can hope to progress without knowledge and from the Outer World you would learn much. The Arnuna are skilled in many things, of which we possess little knowledge, and a mutual interchange of thought should prove very beneficial.

"In the days that seem so long ago I knew something of the principles and practice of radio transmission. Allow me now to profit by this knowledge and by your experience and experimentation. Let us together construct another machine such as you have previously built and let us be the pioneers of an intellectual link which will connect the Inner and Outer Worlds—a bond between your people and mine."

Iala-Vam smiled at his friend's in-

fectious enthusiasm. "Yes," he said, "I shall immediately obtain permission to again construct such a machine and together we shall have success. I agree that both your and my peoples will benefit. Indeed, I had this idea in mind when I first endeavored to get in touch with the world outside. The construction of the machine will present no difficulties, as these were overcome in the previous attempt. You, Sharl-Winsloo, will be the spokesman."

The desired permission was readily obtained from Iala-Vam's superior, who manifested a keen interest in the project, and in the time which could be spared from their ordinary vocations the pair labored incessantly at their self-appointed task. Winslow found his slight knowledge of little use in this big task, and he was quite content to be instructed by Iala-Vam whose grasp of the whole subject was remarkably thorough and complete. The keen bond of self-interest further cemented their friendship, and Winslow spoke much of his boyhood and home-life and hopes, and told of the many little things that affect the lives of his people.

Iala-Vam, having built a previous machine, experienced no difficulty in following the same design from the prints that had been kept, and it was not long before it took a definite and reassuring shape. At last it was almost completed and the only thing needed was to connect up the elaborate wiring system which, because of its intricacy, Iala-Vam preferred to undertake alone.

However, before this could be done, an interruption occurred. The great summons rolled forth again from the "Hall of the Living Sphere." The tests of the time machine in regard to its ability to see into the future had been completed and now the scientists were to behold the future reduced into terms of the present. Winslow and Iala-Vam

had no thought but to obey the call and with their respective superiors were soon speeding in disc-cars towards the great hall.

The great gathering was eagerly discussing the marvelous power of the time machine and the advantages to be derived by a knowledge of the future. All had seen the unfolding of the wondrous past and no doubt was expressed but that the machine would reveal the future, but upon this precise subject the scientists were divided.

An argument was in force concerning the inflexibility or otherwise of the future and Luin-Ko, an eminent physicist, maintained that the future was an inalterable, inexorable factor, which could not be influenced by man. "The future is unassailable and impregnable," he said. "We may see what the future holds but alter it we cannot." A number of the younger men were opposing this theory. "We shall certainly see what the future holds in relation to our normal evolutionary progress," they exclaimed. "But having thus seen the future it is in our power to alter our present mode of life, to invent new processes and generally to depart from the groove in which we are set. By so doing we shall mould a new destiny and a new future which the machine cannot at present reveal."

THE argument would have continued indefinitely but the lights gave a warning flicker and slowly dimmed. The soft throbbing of the huge machine could now be heard, and the audience settled itself to watch the unveiling of the destiny of the race. The crystal began to glow softly and a picture appeared on its mirrorlike surface. The assembled scientists saw the city set out fully, seemingly as it was at present, but a closer examination revealed that many new structures had been erected.

They had certainly taken one step forward into the future.

Like a cinematograph film the moving pictures changed and each time one could note improvement and progress. The disc-cars were now larger, swifter and of an improved design. Televisor stations, like newsstands, were now set at every street corner and pedestrians no longer walked the sideways for there was no need. The footpaths were moving bands and the populace were carried along with extreme rapidity.

The film unrolled and fresh wonders were revealed. The people now seemed infused with haste and bustle and Winslow was strongly reminded of the cities of the Outer World. He reflected that by now they must be closely in touch with the Outside World for men-made transmitters should now be easily able to send television pictures through the rock which separated the two peoples. The buildings presented more of a skyscraper effect, indeed their tops were not visible, for they went far above the levels of the huge glowing crystals which provided the light for the Inner World. The population had increased and the city had spread out in all directions. It was only a question of time when it would prove difficult to comfortably house the people. Food would never be a trouble for Arnunan science had proved that inexhaustable supplies could be obtained from the very rock itself.

By some inexplicable means the time-machine actually focussed into the screen of a televisor and Winslow gasped at what he saw for he was gazing into the Outer World. The great glowing sun beat down upon a mighty city peopled with men and women of his own race, or so it seemed. A large crowd had gathered around a huge shaft, some two hundred feet in diameter, and apparently going down to an enormous depth. A man walked over to a large

board, pressed a switch and an enormous inscription, "20—M," appeared. Winslow could see the people cheering and abruptly they seemed to melt and disappear. Just a glimpse it was and the machine was back again in the Inner World.

Winslow's brain reeled with the immensity of the thought. "20—M," 20 miles? Could it be possible? They were driving a shaft down to the Inner World and soon the way would be opened! He almost laughed aloud as he thought. The way would be open but he was looking into the far distant future. His body would have dissolved into its component elements and be re-assembled into other forms long before the shaft was more than thought of.

The operator twirled the control dials and the screen became blurred as the future rolled swiftly backwards. Presently the scenes steadied and slowed down. A great change was now apparent. The focus of the machine altered until the scientists could see, against the wall of rock which formed the west boundary of the Arnunan domain, a wide shaft reaching upwards through the virgin rock. At the bottom of the shaft rested a vast cylindrical machine and through doors in the lower end of this people were passing out. Others were waiting to enter and the whole scene was, to Winslow, reminiscent of an elevator in a busy department store on earth.

PRESENTLY the machine was full, the heavy doors shut and the vehicle moved upwards at a terrific rate to vanish into the gloom beyond the influence of the crystal suns. The people who had disembarked were moving in the direction of a large building and Winslow's eyes bulged as he perceived an illuminated sign above the entrance bear-

ing the word "Hotel" in English. And, most amazing of all, the people who entered were white. The whole assembly gasped as they realized the significance. Communication had been physically established between the two peoples—the impossible had come to pass!

As the pictures changed it could be seen that many more of the great shafts had been constructed—the roof was literally being lifted from the Inner World, but apparently the Arnunans cared little, for everywhere the whites were treated as equals and they responded in kind. Suddenly there was an interruption; the time machine ceased to function and the lights came on.

The operator's voice clave the silence. "Oh, people of Arnuna," he said, "you have gazed far into the future as you gazed ages into the past, and you have learned in part the destiny of our race. That future is inalterable and though you have seen you are powerless to influence the course which the Arnuna must and will take. Your puny knowledge is as yet nothing. Generations must come and go before you can hope to learn and apply the slowly-gathering knowledge. I have revealed to you the future and towards that future, whether you like it or no, you will work. The time machine has fulfilled its intention. I cannot show you your ultimate destiny for I alone have seen and wondered much. One must leave to the generations to some their future and having thus shown you as much as I dared, I destroy forever the machine."

And to the astonishment of the startled scientists the operator directed a brilliant blinding ray from an instrument, which he suddenly produced, upon the machine, causing it to dissolve into a little pile of brown dust. The great crystal alone remained, glowing softly and unharmed. He turned to his guests. "The performance is now over, gentle-

men," he said sorrowfully, and turning, walked slowly from the room.

Immediately a babble of conversation arose in the hall. Everybody wished to talk and but few wanted to listen. Winslow and Iala-Vam had much to say to each other and they withdrew to a corner where they could talk undisturbed. "Your prediction will be fulfilled," remarked Iala-Vam. "We have seen that the people of the Outer World at last penetrated the rock and that even before this occurred we and they were in communication with one another. We shall be the pioneers, the ones who will first establish the connection. After the next work-session I shall complete my machine and the Outer World lies before us. Call upon me after the second session and together we shall make the tests."

Winslow could scarcely contain himself during the time which was to elapse before he could see Iala-Vam. Several times old Coul-Vani spoke to him and so abstracted were his thoughts that he did not hear. He could scarcely sleep and at the earliest possible moment was in his disc-car speeding at a dangerous rate through the passages to Iala-Vam's laboratories. His friend greeted him with a smile. "I have everything ready," he remarked.

IT was an unbelieving, incredulous world that listened to the first messages from far under the earth's surface. The tremendous power of the Inner World had been projected through thirty miles of solid rock and on a 1000 kilocycle band had blocked every other transmission. The engineers of the Radio Corporation recognized the same force which had interrupted commercial radio some years previously, but in this instance the unknown announcer was using English and speaking of seemingly impossible things.

The voice gave itself a name. "I am Winslow," it said, "and I am speaking from the laboratories of Iala-Vam in the country of the Arnuna situated thirty miles below the Great Sandy Desert of Centralia." The engineers and other listeners gasped as they heard the words and hastily the direction finders were brought into operation from every quarter and, to the amazement of all, each pointed towards the interior of the Australia continent, to that great sandy waste which supported neither man nor beast.

Then the previous attempts of years ago to locate a transmitter in this territory was remembered and the data concerning this was brought to light. The world was beginning to believe, as it listened to the powerful voice of Charles Winslow telling his story and the story of the Arnuna people. The complete disappearance of the R. U. O. Co.'s plane was still fresh in the memories of the present officials of the company and gradually, as the story was unfolded, a sceptical world believed, and having believed, urged the Government to release from his underground prison the unfortunate engineer. But this was easier said than done and in spite of the vast knowledge at their disposal, experts were aghast at even the thought of penetrating through so many miles of the earth's crust.

The years rolled on and communication between the Arnuna and the peoples of the Outer World continued. With Winslow's assistance, learned men of the Outside World now spoke to Arnunan fellow-scientists through the intervening rock. Already attempts had been made to pierce the thickness but there were many difficulties to be overcome and the deepest shaft was only eight miles down with but scant possibility of being deepened.

Time passed and at last the melancholy news of Winslow's death was received from the Inner World and the peoples of all nations mourned him as a personal friend.

the two peoples would meet face to face but science was making tremendous progress. The whole world looked forward to the time when the Arnunan Domain would be accessible to their friends of the Outer World.

The period had not yet come when

THE END



1. On what natural or cosmic dimension was the meter of the decimal system based? (See Page 9)
2. What irregularity in the contour of the earth affects the basis of the metric system? (See Page 10)
3. What were the terminal points of the arc of the meridian giving an almost perfect average arc? (See Page 10)
4. What is the difference between the pace and the step and how does it give the origin of the word mile? (See Page 10)
5. Give an example of a terrestrial great circle. (See Page 11)
6. What ancient measure is still used for shoes? (See Page 12)
7. What unit of weight does an Englishman use for the human body? (See Page 13)
8. About what is the relation of the weight of a proton to that of an electron? (See Pages 15-16)
9. What is the constitution of the boron atom? (See Page 16)
10. What is the probable origin of the word "brimstone"? (See Page 19)
11. What determines the weight of an atom? (See Page 20)
12. What is a trypanosome? (See Page 21)
13. What effect has high velocity on solid bodies? (See Page 28)
14. What is the proportion of silica in the earth? (See Page 32)
15. What would be the difficulty in quickly acquiring high velocity with a space ship? (See Page 41)
16. About what is the distance of Mars from the earth when at its nearest approach? (See Page 45)
17. What is the length of the year of the planet Mars? (See Page 66)
18. What was the race of aborigines that once inhabited Central Australia? (See Page 87)
19. Can one imagine radio waves produced by cosmic disturbances? (See Page 88)
20. What is the approximate diameter of Ceres? (See Page 116)
21. How many asteroids have been identified? (See Page 121)

Escape From Ceres

This is a picturesque story depicting hardships and peril on the asteroid Ceres, but with a happy denouement.

By CLARA E. CHESNUTT

HE hadn't thought they could convict him. Back on earth, his lawyers had told him so. But here he was—ticketed and fingerprinted and numbered like any criminal—on Ceres. He looked around him. His fellow workers, like himself, were grotesquely sheathed in heavy lead plates. The energy that escaped, in the planetoid control room, was enough to kill a man unprotected.

The clang of the gong cut through the machinery's incessant clamor. "Change shift!" shouted the guard, as each prisoner was replaced at his post by a similarly clad figure. Monstrous in their bulky suits, the relieved men crowded into the elevator.

At recreation period he was sitting in the main hall, feeling lonely, when someone spoke to him.

"Got a cigarette?"

"Sure!" He fumbled in the wide pocket of his tunic.

"Haven't been here long, have you?"

"Two weeks."

"Guess you were earth-sick the first few days?"

"Yes—you see," he explained, "I'd never been away from earth at all."

"Don't I know? Say," said the other, confidentially, "I was in bed a month. That was four years ago."

"Four . . . you've been here—God, I don't see how I'll stand it!"

"Cut it, fella! Won't do you no good to think about it. How long did they give you?"

"It was murder—twenty years."

"Well, kid, better make the best of it—can't do anything about it now. My buddy got out last month. What say we're pals? Lawrence is the name." He held out his hand.

"Mine's Stanton—and I'd sure like it a lot."

"Howdy, pal!"

"Maybe I'll get along," said Stanton. "You've helped me feel better already."

But months later, when the sudden glare of artificial sunlight lit his cell, Stanton remained on his cot, shivering.

"Come on out," yelled the guard. "What th' hell—"

"I can't," he moaned, "oh, I can't!"

"Git up there, you—"

He forced himself to rise—put on the rough khaki tunic—

"Lawrence, I think I'm going crazy," he said when they met.

"Snap out of it, kid! You'll do."

"No," he said hopelessly, "no—I'll die here—"

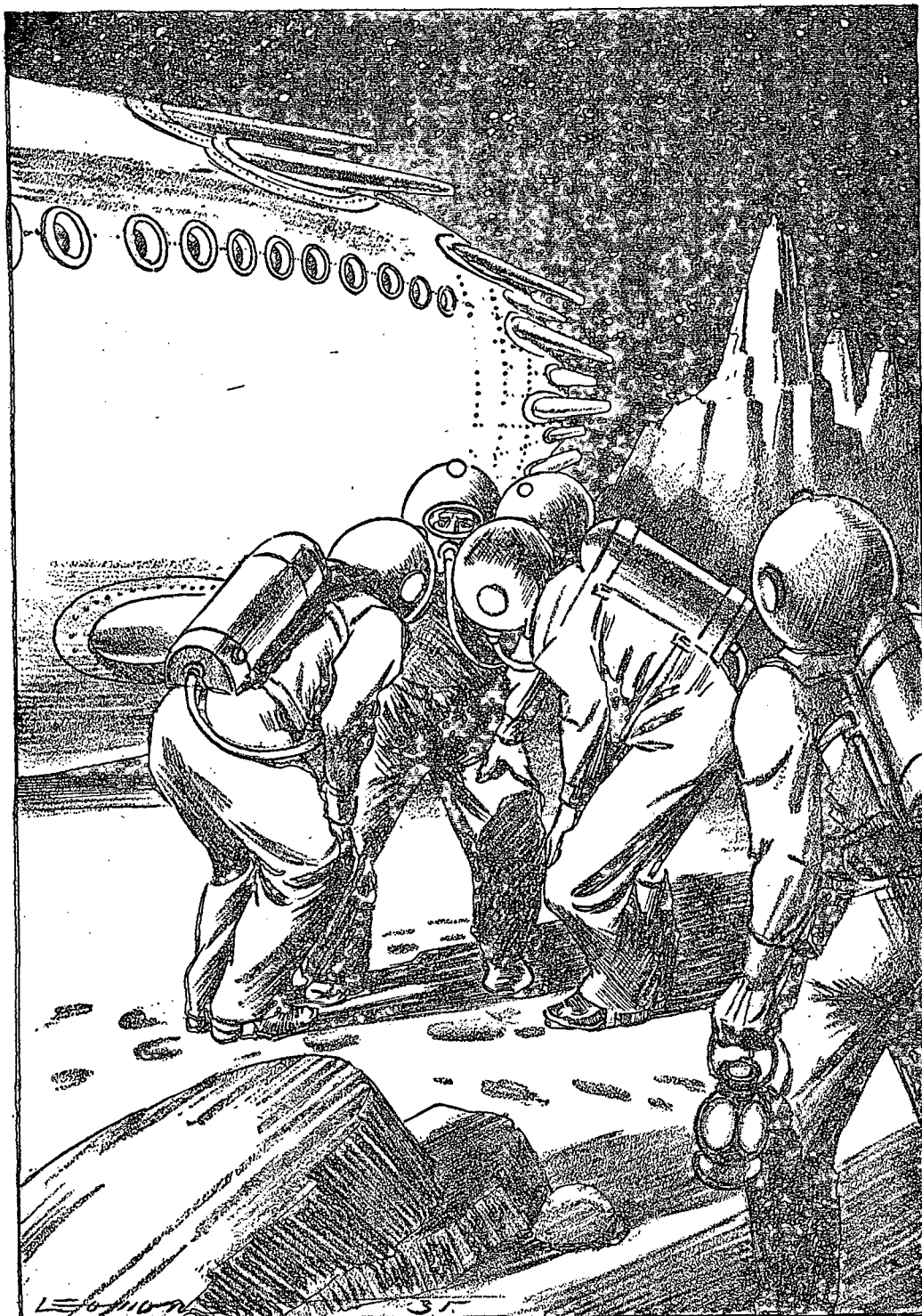
Lawrence stared at him helplessly.

"I was going to be married—back there," muttered Stanton. "Then it happened."

"I know."

Abruptly a rending boom crashed into the murmur of voices around them. As the echoes rolled dully through the corridor, they gazed at each other in startled silence. Outside they heard a confused medley of sound, and the prisoners moved toward the door, excited and curious.

A group of guards was coming toward them. Then the warden of their division stood before them. "There was



They huddled in a circle, helmets touching. Only in this way could they communicate in the vacuum of space

an explosion just now in the powder works. You all know what that means—unless the breach is repaired immediately. Although we have already cut that block off from the rest of the section, the door was damaged and our air is escaping. I am going to select a crew to go to the surface."

Stanton found himself, with Lawrence, in the group of thirty that was at last marched off to the air locks. Here he donned the heavy woolen underwear, the form-fitting garment of copper mesh with its small battery, the suit of treated fur, last of all the great round helmet and the oxygen tank that was strapped to his back. Thus clothed, he could venture for a brief period into the frigid airlessness that was Outside.

The surface was bare rock, frostily gleaming in the sun, black in the shadow. Stanton stared at the sky—at the stars and the planets scintillant like diamond chips on black velvet. One of them was home. He turned to his task. They were clearing off the space, in preparation for the work of covering it with a metal roof welded into place. The lifeless silence in the rooms below, where that same day men had been working, made it seem horribly empty.

Now Lawrence was speaking to him, urging him away. At last, in his abstraction, he grasped what his friend was saying. "Listen, kid—you want to be back on earth—soon?"

"What?"

"Escape! Don't stop to ask questions. Come along and don't worry."

"But it can't be true—"

"Come on. Hurry!" Lawrence broke into a stumbling run, hampered by the uneven ground and the furry bulk of his suit. Stanton followed. They had been joined, he saw, by others—five of them. Then he saw the transport, huge and motionless ahead of them.

They huddled in a circle, helmets

touching. Only in this way could they communicate, in the vacuum of space.

"Now get this. If anybody here don't feel he can stand the gaff, better go back now. We're going to hide between the inner and outer walls of the transport. It's due to leave for Mars in ten minutes. Murphy, here, isn't going with us; he's to screw the bolts on again, when we're inside. When the time comes, we'll use the torch to get out. Once on Mars, we'll reach earth some way."

The plate came silently into place, and they were in darkness. Stanton reached out a hand to feel, reassuringly, the presence of his friend. He sensed that someone was moving, already seeking a more comfortable position. His grip tightened on the brace he was holding, and he strained his eyes into the blackness. He might have been deaf and blind, for all his senses told him. Then he wanted to scream, and wondered if the others felt so, too. But he heard himself talking aloud, and the sound cheered him. The others were very still.

The few minutes that had passed seemed hours. Suppose they were all dead, all dead but him! His reason told him that he could not have heard their loudest shouts. They could not help each other now. He seemed to have been suspended* in the dark, clutching his metal strut, for hours—weeks—years. And the complete absence of light was doing queer things to his eyes. He felt that he would never see again. He would have given all his chance of escape to be back in his cell. But there was no return now.

Abruptly there was light. Someone had a flashlamp. Stanton, blinking in the illumination, and feeling at the same time it had saved his sanity, stared curiously at his companions. They were strangers—all but Lawrence. One was

* The artificial gravity of Ceres was not in operation. It is less than 500 miles in diameter.

hardly more than a boy, and his blue eyes were frightened. Lawrence seemed at ease, and smiled reassuringly. A great surge of hope lifted his heart. Soon—soon, he would see home again!

But the others were restless. Stanton could see the indicator on the oxygen tank of the man beside him. The hand had swung over three quarters of the first space. How long had he been working at the breach? Fifteen minutes—half an hour—but certainly the first shock must come at any minute now! The tanks had been full when they came out at five o'clock, and each space marked an hour's normal breathing. The transport was due to take off at five thirty. But still the concussion for which they braced themselves did not come. Stanton watched the indicator, fascinated, while that last quarter was covered. The hand marched on, relentlessly.

Minutes stretched into another hour. The men were motionless in that ominous stillness, as the minutes that meant life to them went by. Perhaps their lips moved, but Stanton could not have told whether they were cursing or praying.

Two hours late, the great ship shuddered—poised—lifted. Shock succeeded shock, with increasing speed. And at almost the same moment, within the prison, six men were found missing from the line-up.

The man who built the first space ship, a hundred and fifty years ago, had devised double walls to protect the crew from the shock of rocket discharge and the jolt of passing meteors. Next to the outer shell, confined to the narrow space between the two, the escaping convicts had no such protection. Holding to his strut with stiffened fingers, Stanton prayed at every jolt for the strength to survive one more such strain. Once he had let go, to be tossed back and forth against the two unyielding surfaces until

he was glad to seize his strut again. His body was bruised and aching, and his numbed brain held just one thought. Hold on!

Wedged under a brace, the lamp continued to give them light, light that showed pallid faces, sweat-streaked behind the steaming glass, straining bodies lost in the heavy formless fur of their suits. Their shadows loomed behind them, and the smooth walls curved into darkness in every direction.

The last rocket had seemed less violent, somehow, than those it immediately followed, and Stanton waited anxiously for the next, hardly daring to hope. But the next one did not come. Then he realized that Lawrence's helmet was touching his.

"Buck up, kid, that's over for a while. This stage of the trip doesn't need any acceleration. Of course it's pretty bad, and we'll have the same thing slowing down, but you'll live through it." Stanton looked at him gratefully, unable to speak, but he managed the ghost of a grin.

But now that the buffeting and wrenching were over, and he could rest, his muscles flamed in agony, and his head throbbed unceasingly. All six of them were motionless now, huddled in the trap of their own making, conserving their energy.

Stanton hardly moved to avoid the recurrent impact of meteors upon the wall against which he rested, in the sharper pain of protesting limbs. Hunger and thirst troubled him, and he panted in the dead air of his helmet. He might have opened the valve wider in his oxygen tank, but that, he knew, would exhaust his supply before they reached Mars.

Then he felt the cold. When he looked up, the others were shivering. His body, sweat-soaked under its layers of clothing, was chilled. His head swam queerly, and he wondered if he imagined that

the light was failing. But all of them were staring at the glowing wires, which gradually sank to a dull red. As they watched, the light went out.

Numbed by pain and cold, Stanton hung grimly to his support, and wondered how much longer he could endure hunger and thirst and torturing blackness. He had lost all sense of time. Always, it seemed to him, he had existed in the eventless dark, for eternities past, and unending ages to come. But suddenly he felt movement, and it jerked him back to realization. A helmet touched his.

"Lon is dead."

Stanton strove to grasp the meaning of the words. At last he could think, could question, "Lon—who was Lon?"

"The young one. Maybe you didn't notice him. He was a big shot back in Nork. Smartest guy with a gas-rod you ever saw."

"How did it happen?"

"He couldn't stand it. Cocked his tank wide open, and the line exploded."

Stanton made no reply. Soon after that, he began to gasp for breath. He could hear Lawrence panting when their helmets touched.

"Keep on as long as you can," whispered the other. "Then cut into your emergency supply, and partly close the valve. The transport is late."

"Maybe," whispered Stanton, "we'll never reach Mars—alive." But the silence that answered was as intense as the blackness. Mechanically he connected his reserve and reduced the opening. He had given up hope when the first shock came.

How he lived through the hell of deceleration he never knew. Finally, he lost consciousness.

He came at last to his senses. His helmet had been removed, and air was hissing into the space. With the torch, one of the men was cutting a neat hole

in the wall. It was dark night outside.

"It's warm. We'll have to take off these things," someone said.

"When we get out."

The metal glowed and disappeared where the ray touched it. Swiftly the way to freedom grew before them. Then a slab of metal detached itself from the side of the ship and landed with a faint thud on the ground. Five dark forms emerged silently from the opening. Quickly they removed the heavy furs and the garments of woven wire, and stood bare-foot in nothing but the woolen underwear.

"I know a fellow in the terminal," whispered Lawrence. "He'll do something for us." Cautiously they moved forward, feeling oddly light in the unaccustomed gravity of Mars, where there was only the natural factor.

High up on the patrol level, a lookout saw them, and looked again to make sure. When they rounded the nose of the ship, they found a body of guards waiting for them.

Stanton was at the end of the line when he found they were surrounded, and he turned, evading the futile grab of a Martian, and ran. Away from the lights of the city he fled, and behind him he heard them coming. The big Martians came with long strides, but he was desperate, and on Mars he weighed just fifty-seven pounds.

With his last great leap he felt the hue and cry drawing near, and before him rose a cement wall. He ran beside it, and at last his anxious search revealed a vertical line of iron pegs, set into the stone. Was he to be captured now, after the hours of torment? He climbed, forcing his hands to grasp and his bare feet to cling. Below him, his pursuers had reached the barrier.

The last peg—and he scrambled to the top. But his enemies were shouting up to the watchman, who was running

toward him. He jumped—far into the mile-wide waters of the Main Canal.

* * *

Six men had left Ceres in that hastily conceived dash for liberty. Four were returning, well guarded in the transport cage, and the horror of the flight to Mars had not left their eyes.

The pilot reported to the warden, who had the records of the fugitives on his desk.

"BX212 was drowned," he said.

"Stanton?" asked the warden.

"Yes, sir."

"Too bad," said the warden, looking at the papers before him.

* * *

Stanton, in the cold water, rapidly drew away from the gesturing group on the levee. He was panting from his exertions, and allowed himself to float with the current. It was swift, and soon he found himself in a smaller branch of the planet's complicated network of waterways. Then his feet felt firm ground, and he pulled himself ashore. Stretching out on the hard soil, he slept.

The sun rode high above the horizon when he woke to new discomfort. Although no longer thirsty, he was hungry and cold. His lungs struggled for oxygen in the thin atmosphere, and his muscles were lame and sore. An overpowering lassitude gripped him.

He was lying on moist red sand beside a small stream, and all around him towered the vegetation of Mars, which here seemed to be all of the same species, its mass of blue-green almost hiding the sky. Among the leaves he could see yellow balls.

At last he managed to stand up, shakily, and he picked one of the fruits. He broke it open, uncovering two rows of flat red seeds. They had a queer taste that was not unpleasant, and he ate sev-

eral, but after eating them he was very sick.

He lay on the ground, moaning, when the Martians found him. They looked with curiosity at his hair and beard, and carried him to the community dwelling. He raved in delirium when they put him to bed.

The experience through which he had passed was not to leave him lightly. His recovery was slow, and he lay for days watching the big-headed children, as tall as he, who played solemnly in the room where he lay.

The bluish growth that Stanton had seen was food and drink and clothing to the peasants, but it could not be eaten raw. When Stanton was well enough, he went out with them and watched its cultivation. He learned the way to the nearest city (they pointed, chirping incomprehensibly), and tried to plan. Without identification papers he could not get back to earth, and he had no money for bribes.

One day there was mild excitement in the community, and he followed a delegation to the edge of the canal. A dead man lay on the shore—a Terrestrial! The Martians refused to touch the body. Stanton signalled that he would do what was necessary and waved them away.

Eagerly he examined the corpse, and his heart leaped when he found identification papers, though he recoiled from the thing he was about to do. The man was his own size, thank God! The heavy brutish face was bruised, and the skull was fractured. He felt an instinctive repugnance to the filthy rags on the body, but in pursuance of the plan he had formed he took off the frayed underwear and dressed himself, with feverish haste, in the dead man's clothes. Then he scooped out a shallow grave, and covered the body with red sand that glowed like blood in the fading daylight.

He thrust the papers into a pocket, and struck off through the fields towards the city.

At sunset, the next day, he reached it. He was tired and hungry, but there were no kindly peasants here. Martian dogs, beasts the size of ponies, snapped at him as he passed. He slunk into the shadow of a building.

A Martian in uniform barred his way. Humbly he asked the direction of the transport agency. He followed the Martian's pointed finger, and at last he stood in the depot before the dispatcher, inquiring for ships to earth. He spent the night on a station bench.

Early in the morning Stanton applied for work—any kind of work—on the *Eagle*.

"Can you wash dishes?" The captain was looking doubtfully at Stanton's rags. "Maybe we'll be able to give you a passage."

Hope and longing surged in Stanton's throat—he could not speak. Mute he followed the captain into the office.

"Let's see your papers," the captain said. When they were opened before him, his expression changed. "I can't hire you!" he exploded. "Why you had the colossal gall to come here, I don't know. You might have known that your reputation had reached here ahead of you. You're a mischief maker and a dope peddler, and I don't propose to have you on a decent ship. Here! Take your papers and your worthless carcass out of my office!"

In the weeks that followed, Stanton met similar treatment wherever he tried. Hope changed to despair when he realized that no reputable ship would have him. Many times he cursed the identity he had taken, but where could he get other papers? He seemed doomed to stay on Mars.

He learned to salvage food from the refuse heaps and drink the dirty canal

water, to scramble in the dust for a casual coin tossed in charity. He slept where he could. Months had passed since he left Ceres, and he was no nearer home than ever. Yes, he was free! But freedom itself meant nothing, on an alien planet.

Then he heard of an old tramp vessel—scarred veteran of the skies—waiting to take off at the lower end of the spaceport. He decided to apply there.

The captain was a huge Martian. He spoke English with a strong accent. "Yure," he said, "Aw know you tough. Aw heard bad fing w're you work. But Aw fink Aw cain use you. *Orran-kopeh*, you work, damn you. Vis ain no pleay-ure trip!"*

The trip to earth was, in its own way, a torture. In the slow old tramp it took a week. The captain was unsparing with kicks and cuffs, and the crew soon found that Stanton was not one of them. The first part of the voyage he spent in the stifling heat of the firing room, ramming in the heavy charges until it seemed his back must break with the heavy toil; then he was put to work in the galley. The crew was short-handed, and he filled in wherever another man was needed, doing all the dirty and dangerous jobs.

Toward the end of the journey, when Stanton was laboring again in the firing room, the captain began to hint, slyly, that he would not be allowed to leave when the ship touched earth. Mental agony was added to physical torment. Had he come so far to fail at last?

But suddenly the deceleration was over, and they slipped into a long smooth glide. As the ground came up to meet them, Stanton was standing with the others, and, despite his shrinking dread that he would be detained, no one made a move to stop him. At last the great

* The Martian pronunciation is peculiar to Mars. Many of their consonants have no parallel in English, but I have reproduced them as nearly as possible.

door swung open, and he walked out, leaving the ship and his fear behind. At first, due to the sudden increase in gravity, he stumbled and almost fell; then he threw back his head and breathed deeply of the sweet air, gazing hungrily at the familiar trees that bordered the port.

Somehow, he must reach Nork. It was not far. His father would help him, when he knew. And Diane—? He wondered if he could ever reclaim his lost happiness. Certainly he must get to Nork as soon as possible. But first he turned toward the waiting room, with its long comfortable seats. Now that the strain was over, he felt very tired. For months he had yearned and striven to get to earth, and now he was here. The aching nostalgia had been appeased, but he must go to Nork, he must walk, and he was exhausted. He took an uncertain step into the room that invited so, and hesitated. The people in there were sane and normal and clean, while he

stood in his oil soaked rags, face and hands grimed deeply with firing room soot. But he was—so tired. Slowly he went forward.

The man standing in front of him was a stranger, he was sure—why should his face seem familiar. The other came forward and touched his shoulder. He recoiled, on the defensive.

The stranger was looking at him incredulously. "You're not a ghost, are you? We all thought you were dead—drowned in that big canal up there! But I never forget a face—you are Stanton, aren't you?" Memory stirred . . . now he knew! It was the officer—the fly detective who had arrested him, on that distant evening when Berry was found murdered. He stared at fate in numb silence. Hopelessly, wearily, he held out his wrists for the relentless handcuffs.

"Man, you're not going back to Ceres!" cried the officer. "The papers have been full of you. Johnson confessed—the day after you got away!"

THE END



Asteroids or Planetoids

The sun is the center of a system of bodies held to it by gravitation, and prevented from falling into it by the centrifugal force due to the approximately circular paths of their orbits around the sun. Mercury, Venus, Mars, Jupiter and a few others—including the earth are called planets. In addition to the planets there are some thirty satellites, besides our moon, which rotate around some of the planets, making up minor systems, which go perpetually around the sun in groups. But this is as nothing compared in number to the planetoids.

Of these there are a vast number, not yet fully determined. They are called asteroids, or more properly planetoids. Most of them have orbits, close to each other, so that the planetoid orbits are far closer together than are other orbits. Most of them follow paths or orbits lying between Mars and Jupiter and over 600 have been identified. One of them, Eros, comes nearer to the earth at times than any celestial body except the moon.

World Gone Mad

By NAT SCHACHNER

This story has a suggestive title and we are sure that many of our readers will consider that the world went mad during the World War and the madness of war is one of the stupidest performances of man and many feel that today a change for greater simplicity would be a step in the direction of terrestrial sanity.

DONALD RUSSELL sank back in his comfortable arm chair with a sigh that connoted deep content. He was in the bosom of his family, happy in its undercurrent of affectionate intimacy, his pipe was a glowing ember and drawing well, the night was mild yet tonic in its springtime fragrance, and around him spread the well-loved panorama of multi-colored New York. What more could any reasonable human being desire, he queried silently, and forebore an answer in the sense of well-being that flooded him.

He puffed quietly at his pipe, drinking in the ever-shifting beauty of the scene. There was something of the artist in Donald, even though officially he was an inspector of the finished ferro-concrete blocks used in building operations. Fortunately his work day was only four hours long, otherwise the rigid monotony of testing endless miles of blocks for resistance to stresses and strains would have driven him mad.

His soul delighted in subtle nuances of color, in the ceaseless interplay of light and shade, in the gay display of humanity against noble architectural backgrounds. That was why he had carefully chosen his home on the terraced roof of the inconspicuous Metals Building, twenty-four stories above the park-like surface of New York.

From where he sat, with the aluminosilicate sectional shutters rolled back, he could envisage the lofty towers of the metropolis, thrusting their arrogant spires thousands of feet into the air. Each glowed with an inner light, diverse in coloring, that etherialized and made translucent the solid ferro-concrete. Yet he was not too far above the green and flowers of the formal parks separating the cloud-piercing structures, to be unable to distinguish the gay charming people who sauntered, brightly hued, through the spring evening. The sounds of their careless laughter filtered up to him. Above, across the brilliant stars, flitted green and gold specks that were airplanes, cleaving the various traffic ways, each laden with its human passengers enjoying the spring night or with perhaps a cargo of freight.

Donald felt a surge of affection for his fellow-men, for all mankind, who had made possible this glorious, peaceful scene.

"That's it—it's so peaceful, so safe!" He thought aloud in his abstraction, unaware that he had spoken.

"What did you say, dear?" The gentle voice of his wife startled him out of his maze. He smiled a bit sheepishly at the uplifted steadiness of her gaze, her finger still marking the place on the thin-beaten metal page of the book she had been reading.



They peered through the fused quartz lens which magnified in sharp detail the crowded scene below. The parks were hives of activity.

"I did not know I had spoken, Martha," he explained. "I was just sitting here taking in all this—" his hand described a sweeping arc over the great city, "and it came to me that what makes our life so delightful is the feeling of safety, of peace, that enfolds us all. We know that we are leaving a marvelous heritage for our children." His eye traveled fondly to the sturdy little boy of nine who was playing raptly with a tiny airplane, unheedful of his elders. "And we know that they will live to enjoy and improve upon it in security."

"Stuff and nonsense!"

Donald started at the explosive violence of the ejaculation. He had almost forgotten his father. Martha bent down to her book again to hide a little smile. She was used to old Peter's irascible interjections.

"What is, father?" Donald asked patiently, though he knew very well.

"It's all stuff and nonsense, I say," the patriarch repeated in his unexpectedly strong, bass rumble. His eyes flamed from under thick, shaggy brows. "You are all living in a fool's paradise; you and your fine civilization. The next war will bury it all so deep they'll be sending expeditions in the future from some other planet to dig it out again and philosophize over the dead ruins. Safety—peace," he snorted his contempt, "they are words; mere words. I give you twenty years—no more; and then—the end!"

HE warmed to his tirade. "Why are the nations building countless thousands of rocket planes, huge bombers, God knows what other fiendish weapons of destruction? United Europe has a concentration of fifty thousand; the Sino-Russ as many, Australasia maybe half of that; and the Americas—our own philanthropic, progressive, world-minded Americas—at last count, seventy

odd thousand. What about the new radite explosives, one bomb of which could level a city; the terrific poison gases? What are all these prepared for, if not war? One little spark, and the world will go out like a flame. *That's* what your scientific civilization is headed for—destruction."

The old man subsided, exhausted from his effort.

Donald chided him affectionately, "Now, now, dad, you know these long speeches tire you out dreadfully. At your age you should be content to float gently on the stream of life, and not worry about viewing things with alarm. You'll find that our generation and the generations we beget are more reasonable, more scientifically minded, more *civilized*, than the one you were born in. War to-day is unthinkable, hideous. It is an outworn barbarism that the human race has sloughed together with many other cherished prejudices and manias."

Martha nodded her head fondly at her husband's cogent reasoning. Much as they loved old Peter, he *did* get tiresome at times with his endless scoffings at their present existence; with his staunch refusal to accept the progress of the world since the days when he had been a young man. There was a favorite phrase of his that especially irritated her with its illogicalities. Ah, there it came—it was inevitable.

Old Peter had burst out: "Poppycrack, fine talk! Let me tell you something, son; you can't change human nature. In my day we also thought and spoke the same as you; even though every country—and there were many little ones then—was armed to the teeth. We thought it didn't mean anything; there couldn't be any war. And then—smash—it came. I was through it; I know what it was like. You can't realize the beastliness, the fury of the thing, from reading

books. And, mark you, we had crude, primitive weapons, compared to what has been evolved to-day.

"That's the curse of our present science. It has brought to life mighty engines of destruction, and the nations have built them. Sooner or later some hot-headed fool, or group of fools, will itch to put them in motion—as if they were playthings. Why, I can remember—"

But Martha was no longer listening. Old Peter had been over the ground so many times. Her eyes strayed to the time signal. It flashed the hour of twenty-one.

"I wonder what's keeping Allan," she worried, "he telewrote he'd be here at twenty, and it's an hour over now."

Allan was her oldest son, in the Government Service, private secretary to the Communications Chief.

"Nothing to be alarmed about, Martha," Donald soothed, "no doubt he was detained at Washington. He'll be along any minute."

The mother sighed wistfully. "I'm looking forward to this little visit of his so much, I don't want to lose a minute of it. We see him so little."

"That's the sacrifice we must make for having a son in Government Service. There are no four-hour days for them."

The boy, Anders, had abandoned his toy, was tilting his small head back at the heavens. A green flash dissociated itself from the darting midges, hovered high overhead, and commenced a slow vertical descent.

Anders' clear childish voice rose to an excited shrilling.

"Look, mother, he's coming; big brother Allan's coming. See!" He pointed a chubby finger at the dropping helicopter.

Donald peered upward. "By George,

the boy is right. That looks like Allan's plane."

Martha felt unduly relieved; she had not admitted even to herself how worried she had been. Old Peter's fierce gaze, heated by his favorite argument, sheathed itself suddenly in unwonted tenderness. The little boy was dancing around, clapping his hands. It was easy to see that Allan was a well-loved favorite in his family.

THE helicopter came gently to rest on the small landing area outside the alumino-quartz framework. A tall, rather good looking young man dismounted and was immediately overwhelmed in a blur of small legs and arms. He picked up the wildly wriggling youngster, gave him a bear hug, and deposited him on the terrace. Allan came toward his parents and grandfather, with little Anders hanging to his jacket.

Martha was enfolded in a long kiss, from which she emerged to look at him with fond pride. But mother-like, she chided him gently.

"You're late, my son."

Allan was shaking hands with his father. "I'm sorry, mother, but I didn't think I could get away at all. I just managed to make it."

"Well, you are here, and we're thankful. We've looked forward to this week with you for a long time."

Allan said nothing. Old Peter, seated in his chair a little way off, was watching him keenly. He saw the little start, the hesitant manner of his grandson as he was engulfed in the quick chatter of a reunited family, the frowning abstraction with which he limited his speech to monosyllabic answers. So unlike the genial, ready-witted youth. Old Peter knew there was something wrong. Allan was biting his lip nervously, was trying to say something against the light

patter of his parents; yet didn't know how to begin.

"Allan!"

"Yes, granddad."

"What's wrong?"

The young man started. "Why—er—nothing."

"Nonsense, you can't come that over me. I'm too smart for you. You've got something on your mind and you're afraid to say it. Out with it." Old Peter was dictatorial.

Allan hesitated, his face preternaturally grave. "Well, I—I have to go back to Washington in half an hour; there's some special work I have to do."

Martha burst into an agonized: "But, Allen, your vacation; you promised—"

"I know, I know," he interposed hastily, "but something has come up. Next week I'll be able to make up for it. I'll—"

"Allan, come here." The old man looked more than ever like a patriarch out of the Bible. His grandson came obediently.

Those undimmed eagle eyes seemed to search his very soul. "Allan, you're *not* coming back next week."

"No grand dad," the young man said miserably.

Donald took a step forward, but old Peter disregarded him. Relentlessly he continued his inquisition.

"You had better tell me; you know even as a little lad you couldn't lie to me."

Allan mopped a suddenly perspiring face; there was agony on his brow. His parents watched with anxious incomprehension; even little Anders was round-eyed; but the old man's eyes bored steadily into him.

The tortured young man gave way completely. "If you must know—it's a Government secret—but I can't, I simply can't keep it from you. We—that is, my Chief expects war in forty-eight hours."

If he thought his words would prove a radite bomb, he was disappointed.

His father and mother simultaneously echoed: WAR?"

Then Donald laughed indulgently. He clapped his eldest on the shoulder. "My son, now I know you need a rest. You and your Chief have been scaring up bogies between you. War! Ha! ha! In this civilized age of ours. Impossible! With whom, and for what, may I ask? Nonsense! I didn't know you had taken, as he knew it, your grandfather's talk of the world, so seriously."

Martha had smiled too through her quick alarm.

"Listen to father, dear. You know he's right. Just you come with us to the North Woods for a few days and you'll feel fine again. I'll call Washington and tell them not to expect you."

Little Anders chimed in. "War? What a funny word; what does it mean, brother Allan?"

THE young man looked dully from one to the other. He could see they did not comprehend. Neither, for that matter, he reflected bitterly, had he, until these last few days when the Cabinet of the Americas had been almost continuously in secret session.

Old Peter had risen. His massive limbs still supported his rock-hewn body.

"I knew it," he thundered, pointing a bony forefinger for the very heavens to bear witness, "I foretold it, and you laughed at me. WAR, *that's* what's coming! I knew that human nature was the same as when I was a boy. There has been peace and prosperity too long; the poor fools are bored with themselves; they have playthings they must use. WAR!"

His voice broke to a whisper, as if there was magic in the word. Strangely enough, a certain exaltation lit up his face as with a glow. He sank back into

his chair. Memories of that earlier conflict of civilization obtruded; the World War, some sixty years ago—time-mellowed memories. There was a stirring in his ancient blood; once more he heard the fanfares of the bugles, the tramp of marching feet. He hummed beneath his breath, an old forgotten tune—*Reveille!* The virus was in him, flaring up again.

But Donald, his son, had never known the mass-hysteria called War.

"Allan," he said anxiously, "you are not serious, are you?"

The young man nodded. "Yes, father. Last week a mysterious explosion took place at the rocket field near Bordeaux. Over five hundred planes destroyed. Europe's Council went mad; accused us—think of it—of setting it off. We replied as befitted the dignity of our nation. The next day, at Peking, a thousand planes detonated. The Sino-Russ Soviet frothed at the mouth; sent an insulting message. We answered with restraint, disclaiming all knowledge. The following day, as if by clockwork, Australasia reported a holocaust at Sidney, and blamed us for it. It was all so damned silly."

"We offered to appear before the League of Nations Court to prove our innocence. They all refused. Then, only yesterday, our own base at Denver detonated. Fifteen hundred rocket-craft and bombers, and ten thousand men." His voice grew harsh. "Earl Fenton, my best friend, was stationed out there."

"GOOD God, son, what are you telling us?" Donald felt his world crashing about his ears. "How is it we haven't heard a word of all this on the newscasters?"

"Each nation has established strict censorship. Nothing was allowed to leak out."

"But—but," Donald stammered, try-

ing to orientate himself, "surely the nations of the world are too civilized, too reasonable, to blame each other for these disasters. Can't they see that it all may be only a series of coincidences; or at worst, some band of fanatics trying to stir up trouble between them? Of course they'll get together in teleradio conference, and iron the thing out amicably. Won't they, son?"

He did not realize that his tone was imploring; that he was trying to salvage his belief in the essential sanity of mankind.

Allan laughed; a hard, bitter laugh.

"Of course those foreign fools know we had nothing to do with their silly explosions. But we *know* who was responsible for the awful thing at Denver."

Martha asked timidly. "Who, dear?"

"United Europe and the Sino-Russ."

"Now at last he had his sensation."

"Ridiculous, absurd!" Donald stormed. "How can you say such a thing. What proofs have you?"

Allan faced him calmly. "Plenty. A man who got out alive said he saw a fellow loitering near the Central Hangar just before it happened."

"What about it?"

"That fellow was a Chinaman." Allan burst out raging. "Damn his yellow soul! Lucky for him he went up in little pieces, or we'd have—" His clenched fists showed the seething torment within.

Donald looked at the boy who was his son in astonishment. Was this the smiling, gentle lad he loved and thought he knew?

"Are these all the proofs on which our country is going to precipitate a world war?" he asked in a sort of wondering awe.

"They're enough." Strange how hard Allan's voice was. "It's time we taught these foreigners a lesson."

Donald clutched at a last straw. "But the other countries surely aren't going to fight."

"Aren't they though! We've sent spies out thick as flies. They report tremendous activity in every rocket-port."

Martha said quietly: "And you, my son; you think all this is right and just, to exterminate civilization on such flimsy grounds."

"Such flimsy grounds? Mother, how can you!" Allan burst out passionately. "An outrage has been done our country; our honor has been insulted."

Old Peter sat up suddenly; an old war horse snuffing the shibboleths of old. Honor—outrage—it was sixty years since he had heard those terrible words.

"Human nature! Human nature!" he mumbled. "It hasn't changed a bit. Give them words, and the young will go out to die with a song on their lips."

A cold fear clutched at Martha's heart. She cried heart-breakingly: "Allan—Allan, you are not—not—"

For the first time the shadow of uncertainty passed over the youth's face. He carefully avoided her beseeching look.

"Yes, mother," he muttered.

"Oh God!" That was all, but it tore through the thick silence like a jagged edge.

Donald spoke decisively. "You are not going."

"I must; I've received my orders. At midnight I report to the air-base at Newport. If it weren't for the Chief, I'd have been there now, instead of slipping away to see you."

Outside, the planes gyrated as gayly as ever, the laughter of the multitudes floated up, but on the terraced roof there was a paralyzing silence. Only old Peter was humming softly—a forgotten air: "It's a long way to Tipperary; it's a long way to go-o!"

Allan felt embarrassed, constrained.

"I'd better be going," he said uneasily.

Old Peter arose. "Lad, you are going, and we are staying. But we shall never meet again, nor shall anyone ever meet again. The world is doomed—by man's madness, and the terrible machines he has invented in his arrogance."

"Nonsense," his grandson retorted confidently. "The war will be over in short order. The American rockets will bomb every city of the enemy countries into ruins on the first flight. I've seen the plans. They'll be compelled to sue for peace."

"And what do you think the enemy rockets will be doing to our cities in the meantime?" Donald queried softly.

"Our Cabinet has evolved impregnable defenses," Allan asserted positively. "The Chief has assured me so. The Enemy planes won't come within a hundred miles of our coast."

"The world moves and does not change; word for word the madness runs its course," quoth Peter.

Allan glanced hastily at the time signal.

"Good Lord," he cried in pretended astonishment. "It's twenty-three o'clock. I must get going. Good bye, everybody."

He almost ran to the helicopter.

Martha came out of her stupor, started forward.

"No, no, my son, my Allan, don't leave us!" Her voice rose to a shriek.

Allan pretended not to hear. His trembling hands fumbled at the controls. The wings unfolded, the plane shot vertically up. He was gone!

Donald stared after the lessening speck, dazed. Little Anders, forgotten in the tenseness, was crying. "Big brother, why must you go so soon? You didn't fix my airplane." Martha had slid quietly to the floor in a faint. Old Peter's eyes were glazed with the dimness of the past. A dirgelike refrain

quavered in his throat—*ta ta—ta—ta—*
ta ta ta. TAPS!

THE Russell family passed a sleepless night. Six, the next morning found them dull-eyed, heavy.

"I can't believe it, Martha," Donald burst out. "Allan must have been exaggerating."

The boy, Anders, was looking down through the quartz-bottomed viewpost at the park areas below.

"Come here quick," he called. "See the funny things being pushed around in the street."

They peered through the fused quartz lens which magnified in sharp detail the crowded scene below. The parks were hives of activity. Great tubes, long and narrow, were pointing their wicked snouts to every angle of the heavens. Business-like dumps of shells lay next each monster—Dongan shells that exploded in inverted cones at any desired elevation, and obliterated everything within a cubic mile. Enormous directional beamcasters rested on swinging carriages, ready to blank out power waves and bring bombers crashing to the ground. Groups of grim khaki-clad men were scattered in organized disorder. And the voice of the sergeant rose raucous in the land. Although the hour was early, the parks were jammed with people; every one of the towering pylons had emptied itself of half-curious, half-frightened humanity.

Above, the drab morning sky was a maze of tiny wasplike pursuit planes. Single seaters they were, geared at five hundred miles an hour, carrying tracer shells that disintegrated into a thousand fragments on contact, and little tubes of thick oily poison gas that clung tenaciously to an enemy bomber, wrapping it in a choking, viscous ball from which there was no manner of escape. Hundreds and hundreds of planes wheeled and

echeloned—a brave array in fine array.

Donald turned a gray, drawn face to his wife. "It's true then. The impossible is happening. War in our civilization!"

Martha rocked gently. "Allan, what will happen to our poor boy?"

Old Peter said slowly, very unlike his usual explosive self. "The same that will happen to all of us. We are doomed—the human race is doomed—irresistible forces of destruction are being unleashed."

"But you heard what Allan said," Donald expostulated. "Look around us. Surely no enemy rockets will be able to penetrate these defenses."

"POPPYCOCK," his father said contemptuously. "Wait until the rocket planes come slashing down at a thousand miles an hour, and you'll see how futile these so-called defenses are. In my day they called the forts at Liege Antwerp impregnable, and the Germans blew them wide open in hours."

Martha gathered Anders into her arms with an instinctive gesture of protection.

Donald strode to the tele-radio; tuned in the newscaster. He clung desperately to the hope that this could not be; that at the last moment the nations would realize their folly.

The stereoscopic screen sprang into relief. A correctly silken-clad newscaster, helmeted air-phones clasped to his head, his ordinarily expressionless features tinged with suffused excitement, was saying:

"They are coming fast. Once more out directional vibrators have picked up the enemies' rocket fleets. Forty thousand from the Sino-Russ ports are cleaving the stratosphere at twelve hundred miles an hour. At that speed they'll hit our defenses in less than two hours. The European fleet of thirty thousand is

just taking off. Australasia has ten thousand heading for the Southern Americas. All the world is against us. But there is no cause for alarm. Commanding General Merriam requests me to issue a statement. I shall read it:

"To the people of the Americas. The enemies of our glorious nation are seeking to destroy us. They have insulted our honor, out-raged our citizens, conspired insidiously against us under the mask of friendship, and are launching their fleets without even a declaration of war. Treaties, the peace of the world, mean nothing to them; they are merely so many scraps of paper. They thought to catch us napping; to find us unready.

"But they have reckoned without our brave army and rocket corps. When they come, they shall learn to their sorrow just how ready we are to meet their cowardly attack. And more. The General Staff of the Americas have acted on the principle that the best defense is a swift attack. Our mobilized rocket craft have already been launched into the stratosphere. Every city of the enemy world is marked for destruction.

"I feel that every redblooded, patriotic American is behind the Government in meeting with a dauntless front this cowardly, unprovoked attack upon our liberties. They have commenced a war against a peace-loving people, and war they shall have—to the uttermost.

Commanding General Merriam,

Chief of all the American Forces."

Donald gestured despairingly. "The madness has seized them all. We are in the grasp of forces beyond our control."

Martha was weeping quietly. Intuitively she personalized the impending tragedy. "My poor Allan, what is happening to him?"

"No doubt he is in one of the squadrons flying the stratosphere to shower bombs and poison gas upon the inoffensive people of some great civilized

city," Donald answered bitterly. "What can he do but obey orders. He is but a cog in a vast machine of destruction."

There was a light in old Peter's eyes. "Old times," he almost intoned, "old times—I never dreamt to see you again. Ah, if I were only young again." He threw back his shoulders, winced at a rheumatic twinge, and relapsed into a grumble at this sign of his mortality. "Ah well, I suppose I'll have to be a bystander. These milk-fed fellows, brought up on pap and peace, how they'll bungle this man's war!" He brooded in silence.

Martha, the ever practical Martha, came out of her tears.

"What shall we do, Donald? The newscaster said the enemy will be at New York in about two hours."

"Good Lord," groaned her husband, "I haven't thought of what we can do." He seized at straws. "Of course you heard what he said. There's absolutely nothing to worry about. They'll never get through our defenses."

"Do you believe him?"

Wifelike, Martha had placed an unerring finger upon a small doubt hidden in the back of his consciousness. Little worried lines appeared on his forehead.

"NO, I don't," he finally admitted.

It hurt him to say that. Old Peter would crow at his son's sudden surrender to all he had been won't to scoff at. But the patriarch was engrossed in his own dreams.

"Then we'd better pack whatever we can, and take off for the interior. Come, little Anders, get yourself dressed in a hurry."

"I don't want to," the youngster protested vigorously. "I want to stay here and see the beautiful airplanes."

"You must, darling. Bad men are coming to kill us if we don't hurry."

"I'm not afraid of them," he boasted.

"Big brother Allan will kill them first—poof—poof—just like that."

The quick tears brimmed in the mother's eyes, but she held them back unshed. She grasped her unwilling offspring by the hand, led him firmly to the dressing compartment.

Donald observed her quiet untheatrical heroism with mingled admiration and growing anxiety. What *would* happen to them all?

He turned to his father, shook him gently. Old Peter came out of his reverie with a little start.

"You'd better get ready; we're leaving right away."

"Leaving?" Old Peter echoed bewildered. "What for? Where?"

"There'll be an attack on New York within an hour. We'll head for the safety of the interior."

Old Peter shook himself. "Yes, you had better go. You must protect Martha and little Anders."

"Get dressed then. Take your personal things and valuables. There won't be room for more in the helicopter."

Old Peter said slowly. "I'm not coming."

Donald looked at him incredulously. "Don't you understand what I've been telling you. The enemy is almost here."

"I understand you perfectly," his father replied with more than a touch of acerbity. "I'm not deaf. I'm not coming."

Donald was suddenly weary. He did not feel up to futile arguments with what seemed like senility.

"Why not?" he said.

Old Peter rose solemnly from his chair.

"I am an old man. At best I have but few years left on earth. Civilization, the world itself, is on the verge of extinction. I have long seen it coming. Why should I seek to flee, to embrace unknown perils? Even should we sur-

vive, by some miracle, it will be to a strange new world of struggle and terror, of bestial ferocity and savagery. I have lived my day and found it good. I would not seek to extend it. You are in the prime of manhood, vigorous. You have a wife and children to safeguard. I would be a hindrance. Go with my blessing, whatever that's worth. I stay to see the finish."

Donald was overwhelmed. "What nonsense you are talking," he said lamely. "It is suicide to remain."

"It is just as much suicide to go," the old man pointed out.

They were quarreling violently, ludicrously, when Martha came out, in her flying gear, leading little Anders by the hand.

"What's the matter; why aren't you both ready?" she queried in surprise.

Donald was red in the face. "Old Peter's gone crazy. Says he won't go."

"And I won't," the old man retorted defiantly. "I want to go down with your fool civilization. It'll be a great sight."

They glared at each other.

"Oh you two children," Martha was exasperated. Every moment was precious now. "Hurry now and stop your nonsense. We'll all be killed."

And like scolded children, they turned sulkily to obey.

Beneath, the great city was a chaos of mad movement. The populace had awakened to its peril. The parks were a seething mass of running, shouting people. Helter-skelter, blindly they ran, milling back and forth, shoving, pushing, weaving into an inextricable tangle.

CLOUDS of helicopters took off from the roofs of the high structures, midges that soared desperately to avoid the impending enemy. Straight up they went, frantic with fear, to the traffic lanes already preempted by the monstrous bombers and pursuit planes.

Hundreds crashed into the heavier war vessels, came fluttering back to earth like wounded birds. One great bomber exploded in mid-air, flared detonatingly into oblivion.

The Russell family were clustered now in their helicopter. Donald was working frantically to get it started.

The tele-radio sprang into life behind them. It had been left open in the hurry of their departure.

"People of New York," the newscaster shouted, "take warning. Your cowardly flight is impeding the work of defending the city. Our air force has no room for maneuvering. You are required immediately to descend and remain quietly in your homes. Those who disobey this order will be fired upon."

Donald seethed with rage. He shook his fist futilely at the pictured newscaster, at the swinging aircraft. Already the tiny helicopters were throwing out their vanes, dropping back to their fate. Some there were, who, mad with fear, or more daring than the rest, sought to escape in swift flight. Little puffs came from the great bombers, and the fleeing planes disintegrated into a rain of tiny fragments before the watchers' horrified eyes.

"Old Peter was right. We are destined to remain, for whatever befalls us."

Martha's voice was steady as she climbed quietly out of the plane. But little Anders cried out at the fierceness with which she hugged him to her breast.

Because they could do nothing else, the Russell family stared miserably at the clouds of war planes—the business-like tubes below, stripped for action. If only the defenses would hold!

The newscaster gleamed on the screen. He was stammering with the importance of his message.

"The enemy rockets have divided, five

hundred miles out. Flights of them are shooting swiftly for every important city in the Americas. Two thousand are heading straight for New York. Only a half hour now, and they will strike. Our brave forces are going up to meet them. There is no doubt of the issue."

"No, there is no doubt," old Peter wagged his head. But he did not mean the same thing as the self-important announcer.

Above, five hundred pursuit planes shot suddenly aloft, rapidly diminishing as they gained altitude. At the ten-mile level, the ceiling, they hovered motionless, tiny stinging wasps. The huge bombers held their position, quiescent, five miles up.

The newscaster could be seen to cock his head, listen absorbedly to the message delivered in his airphones. Suddenly he gave vent to a most undignified whoop.

"Listen folks," he shouted, reverting unconsciously to the early patter of the air. "I've got news for you, glorious news. Our rocket flights have hit Europe, and oh boy, what they've done to it! London is a mass of wreckage, Paris is in flames, Berlin is level with the ground, and Rome, why, they tell me you wouldn't know it ever existed. Hurray!"

He snatched off his airphones, and danced crazily on the screen. In calmer moments it would have been utterly ludicrous.

"The poor, poor people." It was just like Martha to think only of that in the hour of her country's triumph.

Donald was exalted out of himself. A curious atavistic strain in this man of peace.

He turned almost savagely on his father. "There, what did I tell you. We've won! You hear me, old croaker," he almost screamed, "America has won!"

Old Peter's eyes flashed. "Aye, we've won, and lost. Look!"

His arm raised solemnly to the leaguered sky. Unwillingly their glances followed.

A thin silver pencil of light streaked athwart the sun's face in a long graceful arc. There was another, and another, until the whole eastern sky was a blaze of fiery shooting stars.

"The enemy has come!"

Fascinated, they watched the meteoric approach, unmindful of their peril. The elongated flashes grew steadily on the sight. Now they were tiny shining cigars, blazing with the unthinkable speed of their hurtling through space, swooping down through the stratosphere upon the doomed city.

The pursuit planes hung steadily on their ceiling, waiting.

The great thousand-foot rockets, now swelled to huge glittering, streamlined war engines, threw out wings; their propellers bit into resistant atmosphere with a screaming whine that shook the air with vast concussions of sound.

This was the moment that the defenders had waited for. Like the wasps they seemed, they threw themselves upon the invaders. Tiny puffs of smoke spat forth, disintegrated into thousands of little baby balls. One clung to a hurtling shape; the huge rocket shuddered, and burst open into a rain of fragments. More of the deadly puffs found their mark, and the air was dark with smashed invaders.

But the tremendous speed of the diving rockets brought the vast majority safely through the barrage, left the pursuit hopelessly behind. Down toward the five-mile level they zoomed, dreadful engines of destruction.

The motionless bombers roared into life. Tongues of flame darted in all directions, until the air level seemed

one vast lake of fire. The enemy rockets dived headlong.

The horrified watchers saw tumbling masses of burning wreckage, saw rockets and bombers linked in furious death grapples. The huge tubes below joined battle. Tons of deadly radite flung high, exploded in cyclonic cones that smashed to destruction everything within range. Friend and foe were whiffed into extinction. Radite was not discriminating.

THE sky was aflame with darting, plunging, reeling shapes. The noise was unbearable. It seemed as if human eardrums could not withstand the tremendous concussions. The little family clung to each other now, stunned, stupefied beyond suffering.

From out the terrible five mile zone zoomed huge bullet shapes. Rockets! Hundreds only where there had been thousands! They flattened their courses, shot in sweeping circles over New York. The radite tubes belched their contents, the downswinging pursuit planes took their toll, but the remnants held steadily to their course.

Donald knew what that meant. He snatched the trembling child into his arms, seized Martha's arm.

"Quick," he shouted. "Down below, or we're dead." He could hardly be heard in the inferno of sound.

Old Peter seized him violently. "You're crazy," he screamed, his white hair fluttering in the cyclonic wind. "Stay right where you are: T'hell with their bombs. It's their poison gas I'm afraid of. That'll catch every living thing below."

Martha turned her white brave face to her husband, nodded to show she agreed with his father. She could not speak against the uproar. With a groan Donald stayed.

Little round things dissociated them-

selves from the racing rockets, little round things that plunged to earth with breathtaking speed. A towering structure, dwarfed by the encircling vaster giants, buckled suddenly, crashed to the ground with a shattering roar. The old Empire State Building, Museum of Antiquities, was no more.

Detonation after detonation rocked the weary earth as one soaring pinnacle after another tottered on its base, disintegrated into shatterings of ferro-concrete.

Yet with half the city already in ruins, the soldiers manning the radite tubes that were still intact, held bravely to their posts; shooting with unhurried aim, picking off the enemy one by one. The parks were bloody shambles, hundreds of thousands of mangled bodies lay in distorted postures, or were buried under tons of wreckage.

Donald prayed with tortured intensity, he who had never been given to prayer. The old man's lips were working inaudibly.

The enemy rockets suddenly diverged, and as at a given signal, thousands of black pellets came dropping to the ground. Donald instinctively shuddered away from the expected earth-shattering concussion.

Nothing came. Only the normal roar of the radite shells. "Duds!" thought Donald joyfully, almost incredulously.

Then, surprisingly, the rockets turned tail, fled as if by a common impulse. Into the interior they sped, soaring up toward the stratosphere.

Old Peter's face was a mask of despair. "I knew it, I knew it," he moaned.

But Donald did not hear him. He was dancing insanely. The weight of terror had been lifted from him.

"We've won, we're saved. The enemy is defeated." He did not stop to wonder at the sudden flight. His stunned brain was unable to reason coherently.

They were gone; that was enough.

OLD PETER glowered at him with furious eyes. "Fool! Fool!" he exclaimed in a terrible voice. "Don't you understand? Come and look." He seized his astounded son's arm in a grip of iron, literally dragged him over to the viewpoint. As he was being hurried along, Donald found time to wonder at the fact that their voices had been so clear, so audible. Why?

Then it was that the silence struck him with a physical blow. The vast uproar was gone; only a deathly stillness, in which the sound of their footsteps rang unpleasantly loud, and Anders' frightened whimper rose thinly. A faint dread came over him, but he had no time to analyze it. Old Peter was literally shoving his head down toward the parks below. "Look, damn it, look!"

And Donald looked. The blood receded from his heart, and welled back in furious pumpings. A dizzy wave of nausea swept through him. It was true then, what his father had prophesied.

Below, where there had been soldiers and guns, thousands of frenzied people, noble parklands, there was now only a heavy greenish sea of vapor. A waveless horrible sea that obliterated everything in green, viscous folds. The silence of the grave was beneath; nothing stirred. Only the topmost branches of the trees showed like dark green islands against the lighter green of the gas.

Donald stared dully at his father. "Poison gas!" Strange how far-off his voice sounded.

"Yes."

The terrible scene drew his eyes like a powerful magnet. Good Lord—the tree tops, where were they? Gone. Only a dark menacing expanse of oily vapor.

"What is it, dear?" Martha cried in quick alarm.

Donald had not known that his face had gone white. He drew upon his last reserve of courage.

"The poison gas is rising," he said quietly.

Martha faced him bravely. "That means—"

"That we have not much more time to live. It had been a good life, Martha. Let us not repine, only—" He glanced at little Anders, whose round eyes were blurred with frightened tears.

His wife stifled a sob. For myself I do not care, but my boys, they have just begun to face life, and now—" Her voice broke.

Old Peter shook a gnarled fist at impotent heaven.

"A lie! Man's progress—a lie! The beast was still dominant in him, and now—he is ended, self-destroyed."

Inexorably the gluttonous gas mounted, reaching for its appointed prey. The little group waited, mustering unsuspected fortitude, waiting, waiting for the inevitable.

A low-flying shape came swiftly out of the west. A lone plane in the silent immensities. A sudden hope flashed

through Donald. Aid—rescue! He must attract the pilot's attention. He pulled off his tunic, ran to the edge of the landing area, waving it frantically.

The flier swerved sharply. He must have seen him. Donald redoubled his efforts, unable to hold back the blinding tears of sudden reaction. They would be saved.

The plane zoomed over the building, dropped a small black object. It missed the roof by inches, plunged into the depths below. There was a deep sudden roar, a blinding concussion of flame, the structure rocked in a dizzying arc, then the firmament fell down and hit Donald on the back of the head. The last thing he heard, or thought he heard, was a maniacal, derisive laughter from above.

Whether it was an enemy plane, mistaken in its way, that dropped the casual bomb, or an American flier, unhinged from the terrors he had been through, was never known. Unimportant too, for the result would have been exactly the same. Four silent shapes lay huddled on the terraced roof of the Metals Building; and the hideous green gas lapped ever higher against the sides of the structure.

The End



DISCUSSIONS

In this department we shall discuss every month topics of interest to readers. The editors invite correspondence on all subjects directly or indirectly related to the stories appearing in this magazine. In case a special personal answer is required, a nominal fee of 25c to cover time and postage is required.

A-New Zealand Reader Likes Our Magazine and Praises Morey

Editor, AMAZING STORIES:

I have been reading A. S. since 1930, and believe it or not, I have never seen a quarterly all that time. Now, if something is not done about it, I'll build a stratosphere projectile gun, and fill the shells with a certain gas (my own exclusive patent), which in 2 (two) seconds will suck from the air, within a radius of 50 (fifty) miles, all the oxygen, and I will aim my metal monster at your building by means of my special television spotter and so A. S. will no longer reign supreme. So don't say you were not warned.

Now for a few nice compliments. Hold on to Morey. Don't let him cross streets alone; he might get knocked down by an automobile. (Nice work, Morey. Keep it up.)

Give us more "yarns," no not "yarns" but "creations" like some of these:

Subjugating the Earth.

Lady of Light.

Swordsman of Sarvon.

Lemurian Documents.

Professor Jameson Series.

Cat's Eye.

Four Dimensional Auto Parker.

Peril Among the Drivers.

Nekokon of Norway.

Hastings, 1066.

The Moon Pirates.

The Master Minds of Venus, and

Triplanetary.

I like the small size much better than the old timers, and as for the rough edges, well—who cares about rough edges? Now, I have a little question for you to answer and don't try to dodge out of it. (Remember my gun.)

When space ships leave a planet they must go up at more than a 45° angle. How, then, do the passengers fare? Wouldn't they fall over or get into difficulties because of the sloping floors, as we don't read of the ships spiralling out of the atmosphere. Of course, that does not include spheres. I would be very grateful if you could throw some light upon the matter.

I like interplanetary stories and stories of time machines, insects, and dimensions.

I have often (through "Discussions") noticed a large number of readers refer to such stories as—The Moon Pool, Into, and Be-

yond the Green Prison, The Man From Space, Death From the Skies, The Other Side of the Moon, and The Nth Man, etc., etc., and so on, and so forth. Could you tell me where I could procure some of these classics and their respective prices?

I hope you will accept this terrible jumbled slipshod epistle and its equally bad spelling and scrawl. So wishing A. S. the very best of success in the next million editions, I will sign off and let some one else have a bit of space to air their views.

Just one thing more. I am only 15 years and would like a correspondent (any country). I will guarantee to answer all letters.

Thanking you for allowing me this space (if you do).

I remain, yours faithfully,

R. Burdett,

c/o Observer Printing Works,

12 Wyndham Street,

Auckland, New Zealand.

(Your letter is quite sparkling. We receive the nicest communication from what we call the "Antipodes." For back numbers address our Circulation Department at this address.—EDITOR.)

AMAZING STORIES in Australia—The A. S. Quarterly

Editor, AMAZING STORIES:

This is the first time that I have written to you, but I have been reading AMAZING STORIES for three years, and during that time I have only read two stories that I did not like in any way and they are, "A Descent Into the Maelstrom" and "Across the Ages" which I read in another magazine some time ago. The reason why I did not like these two stories is that they did not have a single scrap of science in them. But enough of what I don't like, after all I am only one of thousands. One man's meat is another's poison, and so on. The stories that I liked best in the past few issues are: "The Sunless World" by Neil R. Jones; I want more of Professor Jameson; "The Rape of the Solar System" by Miss Stone. By the way, it is a long time since she wrote for "A. S.," is it not? "Men Created for Death," and "Valley of the Rukh," "Island of White Mice," and most of all, "Conquest of the Planets." The last is the most magnificent science-fiction story

that I have ever read. Best of luck to Mr. Campbell, Jr., for giving us such a story. My favorite authors are Harl Vincent, Joe W. Skidmore, David H. Keller, M. D., Bob Olsen and Neil R. Jones. I would like to correspond with an American boy. I will exchange newspaper and native weapons (of which I have quite a few) for back issues of AMAZING STORIES. My age is 14.

John Gregor,
248 Hindley Street,
Adelaide, S. Australia.

(You write an excellent letter, and should secure an American boy correspondent without trouble. The Quarterly AMAZING STORIES appears quite irregularly, it is a quarterly only in name. Your judgment of our authors is very well put.—EDITOR.)

An English Critic of Art Work—Posi and Nega and the Editorial

Editor, AMAZING STORIES:

I have heard such a lot about Morey being superior to Paul that it's got my back up. I think and always will think that Paul is the better of the two. Look at the February cover of A. S. (Quor's shoulder) one side is 1/12 of an inch higher than the other, also the rays of the sun should strike $1\frac{3}{4}$ of an inch below the flyer's knee. Another thing he (Morey) has no idea of color; small things but they show who is the better artist. The stories in the November, December and January numbers were excellent, but the February issue wasn't up to standard. The serial, "The Contest of the Planets" is good so far, let's have some more stories of "Posi and Nega." The editorial is *très bien*, T. O'Connor-Sloane knows his drill. Before I close, I would like to correspond with readers between 14-24. All letters will be answered. I am 19 years of age.

I remain,
A. R. Parkes,
16 Hawgood St.,
Bow E3
London, England.

(We do not agree with you in your criticism of the February cover. It is very good in all respects. The height of a man's shoulders are affected by his position. What you say about the rays of the sun is beyond us—we do not understand the point. You will have more of Posi and Nega. They have made a great hit. We are glad you like the editorials.—EDITOR.)

A Voice from England

Editor, AMAZING STORIES:

Your magazine, AMAZING STORIES, is read as eagerly in England as in the U. S. A. I am one of those who take a great interest in its tales. Of course, it is easy to criticize them as "impossible"—but the sufficient reply

would be that nothing except a plain contradiction in terms is demonstrably impossible, and, in any case, the stories aim at entertainment and at stimulating the imagination, as well as at instruction. Our own H. G. Wells has as one of his most popular stories "The Time Machine"—which really does involve a contradiction in terms, for it implies that a man, by moving a lever, can go into a future time which will exist after his death, or into a past time which existed before he was born. In other words, a man can exist in a time when he does not exist!—an obvious contradiction in terms! Yet this has not made the popularity of Wells' tales any the less. People overlook unavoidable defects in tales which amuse, stimulate, and in various ways instruct.

I was much interested by "The Sunless World," in your December, 1934, issue. The only criticism I would make is this: Surely a man of great intellect, such as Professor Jameson, would not have a desire to preserve forever his mere material body. It seems a childish ambition!

However, your magazine is so full of merit that criticism seems uncalled for. Should you insert this letter I should be glad to hear from any of your readers who may care to write to me at address given below.

James W. Poynter,
106 Gillespie Road,
Highbury, London, N5, England.

(To give life to science-fiction stories it is quite the accepted and acceptable thing to use what are really impossibilities and illogical to carry out the story. If the attempt was made to keep down to prosaic fact no one would read them. As a rule we receive very pleasant letters from England, and this is a good example. The idea of a man of Professor Jameson's intellect having a desire to preserve forever his material body, impresses the writer as a "touch of nature," for intellect does not annihilate sentiment. We shall hope for some more letters from you in the near future.—EDITOR.)

Dr. Keller as an Author Is Highly Commended

Editor, AMAZING STORIES:

A fairly good bunch of stories in the May number of AMAZING STORIES, the best of which was D. H. Keller's tale, "The White City," a swell yarn. The others in any order you want them. Morey did a pretty good job on the cover. Also, the editorial is good as usual.

Alon. F. Wiggins,
2453 Champa Street,
Denver, Colo.

(Dr. Keller is getting much appreciation from our readers. You put him at the head of a good number of authors. Sometimes we fear that the editorials are too warmly commended by our readers. We appreciate your approval of them.—EDITOR.)

A Tribute from England

Editor, AMAZING STORIES:

The March issue of *AMAZING STORIES* is, in my opinion, the best published since the inception of the small size in October 1933. The cover, for a start, is very good. Quite the best Morey has done for some time. His inside illustrations also show signs of improvement, although in one or two instances the shading is rather too "slap-dash." However, I am very pleased to be able to say that the small size has rather increased Morey's technique, whereas other artists have found that the new size detracts from the merit of their work.

The new serial is very good—the "darkness" of the ice-bound earth is very well brought out by author Kostkos. The conclusion to Campbell's "Contest of the Planets" struck me as being rather hurried or cramped. He leaves plenty of loose ends waiting to be tied up, so perhaps he has a sequel in mind. If not, why not, Mr. Campbell?

"Interference" was excellent from a literary point of view. Good characterization—smooth action and well planned denouement. Good work, Mr. Sheridan. Dr. Breuer returns with a story typical of one of science-fiction's greatest authors—(Remember "The Gostak and Dosches," way back in March 1930?) "Zora of the Zoromes," while not being quite as good as "The Sunless World" was well worthy of Neil R. Jones. More of Professor Jameson's adventures, please. Finally "Body Pirate" by Repp—the author managed quite successfully to develop an old theme into a very enjoyable short story.

Well, I don't think there is any doubt that *AMAZING STORIES* is once more on the up-grade. Good luck, and keep up the new high standard.

E. Sutcliffe,
3, Ballantyne Road,
Liverpool, 13
England.

(The writer of the following lines has a great objection to the expression or claim that "he is doing his best." But you can easily realize that the work of our editor is hedged about by many restrictions, so that he never can do everything he would like to. We especially appreciate letters from English friends, we have a very personal feeling about our magazine, and we thank you for your good wishes and are even glad, to get your pleas.

Your letter is certainly encouraging and encouragement is a tonic all of us need. We remember the "Gostak and the Dosches" in which Dr. Breuer achieved a great success. We are so gratified at holding our best authors that we are in danger of substituting author for story in our minds.—EDITOR.)

Another Short Letter from an English Reader
—A Pen Pal Wanted

Editor, AMAZING STORIES:

I have been a reader of A. S. for over two years now, and this is my first letter. I have read other magazines also for some time. I should say that A. S. equals them, if not better. It is a very neat magazine in print and appearance. The editorial and stories are all up to the standard. Another thing—I would or rather do like plenty of Interplanetary. I hope you will fulfill this.

One more thing. I would sincerely like a pen-pal in any part of the world.

Well, dear editor, I think this is about all I have to say, with the exception that I would like this very much to appear in our Discussions and here's wishing you world-wide fame and great support.

A. Marsh,
7, Devonshire Terrace,
West Ferry Road,
Millwall E 14,
London, England.

(It would be of interest to know if "pen-pals," as you picturesquely designate them, are obtained by writers in Discussions. So many ask for them that you will probably succeed in your quest.—EDITOR.)

An Error in a Story and in Its Title

Editor, AMAZING STORIES:

The story "170 Miles a Minute" in the June issue is interesting, but how did such a terrible mistake in mathematics get by the readers—particularly as it forms the title of the story.

1000 miles per hour, which is evidently the speed of the "Hopelite," would be 16.7 miles per minute, roughly 17 miles per minute—not 170.

F. W. Merrill,
1134 Oakdale Drive,
Ft. Wayne, Indiana.

(The oversight was due to the correct figure not being in one's system like 3.1415927 and sundry others. We would not call a misplaced or omitted decimal point "a terrible mistake." We would term it a blunder in proof-reading. But do not think we are apologizing for it. It should not have happened.—EDITOR.)

A Department of Parasitology Suggested for
AMAZING STORIES

Editor, AMAZING STORIES:

I have long been a follower of *AMAZING STORIES*, and intend to remain so. Your magazine is *the* thing. You seem anxious to stimu-

late scientific thought so, why don't you start a reader's exchange. I am a parasitologist living in northern Wisconsin and have available specimens of parasites that my fellow students in the south may not be able to obtain, while my friends in the South have specimens I cannot get. Now, if you had some kind of a department in which I could let my fellow students know what I had, and what I needed, without hitting my depression pocketbook, too deeply, I think you'd find that you had added another reason for our buying your publication. On your competent staff you must have some one who could take up such a department. Or, if not, knowing what is wanted, I'd try to get such a thing going. I know I am not alone in this thought for I have discussed this with my fellow students here at Wisconsin, and find they are all for it. How about it? Will you give us a break?

L. A. Posekany,
Adams Hall,

(Do you not think that "Discussions" fills your requirements? We publish many letters asking for information or devoted to scientific topics. Perhaps this letter will bring results. We will always be glad to give space to such letters as yours, where a definite scientific subject is the topic.—EDITOR.)

A Very Favorable Criticism of AMAZING STORIES from a New Zealand Correspondent
Editor, AMAZING STORIES:

Just a word about the December issue, which is by the way the latest issue out here at the present time.

The cover was a marked improvement on the covers of the past two months.

"Rape of the Solar System" was in my opinion the best story for the month, "The Sunless World" ranking next. "Men Created for Death" was, well, not so good. The serial, "Land of Twilight" was, of course, excellent. I am looking forward to the next installment which unfortunately is the conclusion.

The magazine in all is a great paper and without a doubt is one of the greatest means of education in science. One can sit down and while reading a thrilling story is gaining food in science for his mind without really knowing it.

I wish your paper every success.

Before closing, may I again ask for correspondents who are interested in science fiction in general.

Yours, etc.,

George Stephens,
552 Worcester Street,
Linwood,
Christchurch, E. 1.,
New Zealand.

(Your letter is very encouraging to our staff, who are endeavoring to win the favor of our readers. We can only hope that we deserve its comments.—EDITOR.)

A San Franciscan Gives His Views—Language Authors and Stories

Editor, AMAZING STORIES:

I have been reading "A. S." fairly regularly since 1929 so now I'll have a try at writing you.

I am an Assistant Chemist and "A. S." has given me several good ideas for the laboratory. The time spent on "A. S." isn't wasted.

The edges on the last few issues seem a trifle more even.

Let us have some more articles from Dr. Donald H. Menzel.

The editorials, Discussions, and C. A. Brandt's book reviews are good. As for the stories, I like nearly all of them.

"The White City," by Dr. Keller was good.

"Liners of Time," starts O. K. Fearn says that a shield of lead four feet thick was necessary to keep out cosmic rays. I thought cosmic rays could penetrate 68 feet of lead. What is the right answer?

Morey's illustrations are improving. How about giving us two illustrations in each installment of a serial? The length of an installment offers much to draw from and seems to call for more than one illustration.

To R. McNairn we might say that we have our own language, American-English, a language superior to ordinary English. Any language without slang will eventually die out. For information on language he should read H. L. Mencken.

"The Inner World," by A. Hyatt Verrill will probably be another of his fine stories. I like all of Verrill's work, including his non-fiction.

Every issue this year has been good, keep up the good work.

According to G. G. Clark's definition of "sciencefictionitis" I must have reached the second stage, perhaps I'll soon enter the crisis.

I guess I'll sign off with best wishes for "A. S." and the staff.

C. Hamilton Bloomer, Jr.,
180 Townsend St.,
San Francisco, Calif.

(Your views on language are quite interesting. Only a few days ago a prominent publisher said that a Frenchman recently asked him if we had the word "snob" in the English tongue. The Frenchman didn't know Thackeray. Our space is so limited that we cannot afford more than one page of illustrations to a story. The penetrating power of cosmic rays varies.—EDITOR.)

A Pleasant Letter from an English Reader

Editor, AMAZING STORIES:

I have an announcement to make which will, I am 'hoping, gladden the hearts of those who read it and take note. Often I have read in the famous "Discussions" column about tearful contributors who want back numbers of the Science-Fiction magazines—well, being a constant and avid reader myself, I have a few to dispose of and I was thinking that perhaps some folk who want out of date issues would take advantage of my offer.

I must thank the editor sincerely for allowing my other letters to be published because not only has it encouraged a friendly correspondence between myself and many other readers, but it has served to widen the popularity of the Magazine and also to create a little private business of buying and exchanging.

There is one thing that perplexes me though, and I see no actual reason for the cause. I never seem to stumble upon a letter written by an *English lass*, which is disturbing, because I happen to know quite a few who buy every AMAZING they see. Couldn't they possibly work up their emotions sufficiently to send their views and have them printed. A woman usually sees things that men miss—and I'm sure they wouldn't miss a chance, no matter how slender, of airing their views to the world! Well, that's a challenge to all the fair sex—and I hope I haven't done wrong, Mr. Editor!

The first thing that struck me about the October issue was the gaudy cover. As far as I can remember, the skeleton shouldn't have been in the picture at all!—and Oh! Morey's thin legs! The entire picture lacks depth and I was surprised because Morey's cover work is usually far above criticism.

"The Pool of Life" did not appeal to me somehow. I was ready to read a super-science story and I found a super-horror novelette—a yarn that might well have appeared in a magazine given entirely to terror and nightmare tales.

Next their comes a story by Neil R. Jones—and all I can say to that is . . . does Neil R. ever disappoint his public?

I expected more from Eando Binder in "85 and 87," but I enjoyed the language however and have nothing to grumble about. The illustration wasn't a thing to go completely nuts about, but then, we've grown to know Morey by this time!!!

"Through the Andes" didn't give me such a good time, either; and I confess, after reading "Buried in Space" by Lawrence Smith, I had to rush to my cupboard and

get out a very old issue and read a story quickly to overcome my disgust!

What, may I ask, came over the Works during October? And, being a good reader I have a right to know, when are you giving us another story to equal "The Man from Tomorrow"?

I am also raising up a strong defense for such yarns as that which deals in strange planets—captures—the hero gaining the beautiful chief's daughter—volcanoes and prehistoric animals. Although many a yarn has dealt with the above as the main-stay I never seem to tire of reading them—providing they are well written, naturally. And another thing, don't you (I mean everybody) think that two or three illustrations for the most important story would prove to make the reading more interesting? It's surprising what a well-drawn (?) picture does to a story—seems to ease it along.

I did propose once that a photograph or two be inserted with some data. Perhaps even there could be a flash from the latest science-film? This would, I am sure, be a great improvement and acclaimed by all as being 100% swell idea.

Whaddaya say, gang?

Oh, before I close I would like to mention something about those two things that I dislike intensely. "Posi and Nega"! With the patience of those in the far East I've waded through the stories of these two fantastic jets of life—and never once have I enjoyed the yarn to be able to say: "Dats-a ver' goot!"—instead I murmur, like a lost soul: "Hell! another one?" I suggest that they both be flung in front of Morey's soul-searing ray machines. That should do for them!

Anyway, I promise to answer all enquiries, and wish to tender my Best Wishes to a mag that I wouldn't give up—anyway!

LES. A. PETTS,

"Mount View,"

21, East Court,

North Wembley,

Middlesex, England.

(We have published a number of letters from readers in which they express their desire to have correspondents. Yours is one of the very few who have told us that the desire was corresponded to and we are glad that our letter brought such a result. We have published some letters by English lassies, as we may call them, and we had quite a famous correspondence in which the principal part was taken by an Irish lady. Perhaps this letter from an English reader will bring good results. The word "nuts" is rather a puzzle to the writer of these lines. He has encountered it several times lately and what it means he is not sure of. —EDITOR.)

Some Criticisms on "Relativity to the Rescue"

Editor, AMAZING STORIES:

May I offer some friendly, and, I hope, helpful criticism? This concerns the story "Relativity to the Rescue," by J. Harvey Haggard, in the April, 1935 issue. I will start at the beginning and work through.

p. 115: "Like charges repel." The pirate ship sends out positively charged spheres in a stream, and they charge the two police ships on contact, with like charges. But before the charges on the police ships would be great enough for them to repel each other with any great force, the electrospheres themselves would have been repelled before contact; so a very great charge could not have been built up.

A little later the police ships are conquered by a perfectly conducting gas which is supposed to conduct away all heat from the ships. But the sun's heat should be instantly conducted into the ships, thus preventing their crews' untimely death. "It's just as if you stuck your finger into mercury. Your finger gets cold because the heat is conducted out." But what if the mercury is being heated?

p. 116: Brice is half-blinded by the sun as seen from Pluto!

p. 121: Berlen sends out a call on his radio, and a moment later an image appears. It would take six hours for the signals to travel at the speed of light from Pluto to Earth.

p. 132: The speed of the bullet added mass to the ship, in a small quantity, thus enabling the universe to get a grip on the ship and destroy its motionlessness. But the electrons within the atoms, the atoms within the molecules, and the very molecules of the ship were vibrating at high speeds, and the sum of all these infinitesimal additions to the ship's mass by reason of their speed would have brought the ship into the "cosmic flow" very soon.

There were other things in the story which are impossible with the grade of accuracy of today's instruments, but which cannot be denied to the future.

Congratulations on your July cover! The comet-tail title is just what the cover needs. The whole cover, in fact, looks well. Morey is apparently improving, and so are the stories.

RICHARD G. KERLIN,
Linwood, Nebraska.

(Well thought out criticisms such as yours are always most welcome, even if the cause for the same is not. We will let them speak for themselves. You congratulate us on the July cover and are evidently pleased

as we are by the comet-tail title. The peculiar title has to have some kind of a designation so we think that we will adhere to "comet-tail."—EDITOR.)

A Plea for Stories which are not Scientific Treatises

Editor, AMAZING STORIES:

This is not intended to be a letter of praise, for like Brutus "I come to bury Caesar . . ." nor am I going to hurl any brickbats, but merely make a request. Cannot we return to the old AMAZING STORIES, when stories were stories and not scientific treatises? By this I mean that we are inundated by stories of space ships hurling rays of incalculable force at each other, only to be nullified by even greater counter rays, and so on *ad infinitum*.

There was once a story called "Owls of Ulm" (Forgive me if I have made a *faux pas* and this was not published in your magazine, but it was some years ago, and my memory fails me!) In this story, the characters wore suits with multiple arms, each of which contained a ray, or a ray nullifier. Some of the more advanced costumes resembled nightmare star fish. With each new ray, two arms had to be added to the suit.

Well this is on a par with the space ship rays. Each ray is followed by a detailed and euphuistic account of the basic materials until the mass of useless data makes the reader's head reel as much as the rays' effect on the space ships.

Edgar Rice Burroughs contrives to make his stories interesting, satisfying, and even realistic without masses of collaborative detail.

Perhaps I stand alone, but: *hoc volo, sic jubeo, stet pro ratione voluntas*.

JEFFREY WILKS,
3 Inglewood Mansions,
West End Lane,
Hampstead,
London, England.

(As it happens, our great difficulty is to get stories based on natural science, not merely alluding to it or, perhaps not giving any points therein. Your criticism expresses so accurately your own ideas that it is really not open for defense or confutation. If you will look over our Discussion letters you will find that few people, practically none, express opinions analogous to yours. The fact that there is good natural science in the stories is indicated by the questionnaire with some twenty questions which appear to be a sufficient number, and which are given in every issue and our own inclination would be to give twice as many.—EDITOR.)

A Critic Who Objects to Mr. Fearn Who Seems However to be a Decided Favorite with Other Readers

Editor, AMAZING STORIES:

John Russell Fearn doesn't write science fiction. He writes science-FICTION, with the accent definitely on the fiction and the science practically non-existent. It's pretty hard to write coherently when you're angry. (R. McNairn would have said "when one's ire is aroused"), but, after all, I'm defending my hobby. In the first place: His "glider atmosphere," being lighter than hydrogen, wouldn't remain at "definite levels." It would go as high as it could get. And if Fearn has a metal light enough to float on the lightest gas, he could use it much more efficiently in ordinary air, which would be much denser, making his light metal much more buoyant. Then why generate the scintillations of cubic yards of gas necessary to provide a "glider atmosphere"?

In his robot restaurant, a tremendous centrifugal force prevented the viands from hurtling off. Dr. Sloane, get me a tray and a couple of water-glasses with steel bottoms, please. Now: I fill the glasses with water and magnetize the tray; so. Now, grabbing the tray at the middle of each edge, I dexterously flip the tray over, so that the glasses are underneath. Now I flip the tray back over, very quickly, so as to generate a tremendous centrifugal force. The glasses slide to the edge of the tray, but it is magnetized strongly enough so that they don't slide off. But what, oh what, has become of the water in the glasses? Ask the carpet beneath and the Editors around. The mop, Dr. Sloane. Thank you.

Now for the time theory itself. All these ages exist simultaneously, eh? And man can travel from one age to the other, eh? But if all these ages exist simultaneously, and I visited every age, I would therefore exist simultaneously in every age. Suppose I went back to my own age, half an hour before I was born? Would I cease to exist? What would become of my second self when I was born? O.K., then. Time travel into the past is impossible if I can actually exist in that past.

Now suppose that I voyage into the past or the future, *à la Fearn*, and returned to my own time-span just in time to rescue myself from a gangster who was about to end my life. I put myself in a time liner and travel back to a time before I left on my original voyage. Now, when the time comes for that voyage, I split in two, because I went back to my own age, half an hour I rescued myself from gangsters in the future, so I have to remain behind. Mean-

while, my other self, existing in a different age, (a possibility according to Fearn) lives through my life to the point where I am about to die from lead poisoning, when I again show up in time to rescue myself, and the circle starts over. I would be immortal. Always I would have to rescue myself just before I died. How about it, Mr. Fearn?

Re the method of propulsion along the time-stream: Would it be much simpler, Mr. Fearn, to install a set of screw-propellers to drive your liner along the gas of evolution? But how does moving your liner through space affect its position in time? You neglect to explain.

Mr. Fearn, have you ever seen a dictionary of the English Language? Mine gives the following definition for one of your pet words: "*Dissemble— to hide under a false appearance; give the semblance of something else to; to act the hypocrite.*" Sure you haven't been standing under the rays of one of your dissemblers, Mr. Fearn? (He meant "Dis-assembler," or "De-assembler," I'm sure. But he still deserves the raspberry for not saying what he meant.)

And now for R. McNairn, the Irate Aussie. (I hope *ThaT* makes him boil!) He starts out in a way that makes it imperative for every true lover of science-fiction to agree with him. You should never have said that you didn't believe in space-flying. Your magazine is supposed to be broad-minded to the point of admitting the possibility of everything not proved ("proven," Mr. McNairn) impossible. It is as though the president of a toy-shop solemnly stated that he didn't believe in Santa Claus. That famous statement of yours, Doctor Sloane, probably cost you more readers than the printing of more stories by Fearn is going to cost you.

Now for the ultimate penultimate. Even H. G. Wells can't bring himself to retain that "U" in all cases. He says "colour," and "odour," but when he gets to hybrids, is it "colouration"? No-no, Mr. McN. Mr. Wells goes American. "Coloration" and in bold-faced type at that!

And the English *don't* own the English language. We are developing a language of our own. And the changes that McN. objects to are the changes that prove my statement. If the English Language is set down in definite and unchangeable channels, why do not the English People speak Shakespearean, or even Chaucerian English? The answer is obvious. Languages grow and evolve, even as man grows and evolves. You object to the editor's conservatism in science. And in the same letter you reveal yourself as a hopeless conservative in English.

We will now end the meeting with the benediction: "In short, Mr. Fearn, for *not* using your knowledge and training to write *real* science-fiction; for doing what (nearly) all other authors do and what has made science-fiction the (Censored-Bill) literature it is today; for writing ("Liners of Time" and other things to drive me crazier); for all that, Mr. Fearn, "nuts to you." And to that brick-batty Aussie.

W. B. (Wild Bill) HOSKINS,
44 College Avenue,
Buckhannon, W. Va.

(We shall leave any criticism of your letter to Mr. Fearn. We really feel that you are a little hard on him. You must realize that there is always a danger of science fiction drifting into dryness and losing life. We do not know why you want to make poor Mr. McNairn "boil." We cannot agree with you that it was broad-minded to admit the possibility of everything not proved. We think the right point of view is to omit, if possible, the "U's" in the words you speak of. Why do you sign yourself "Wild Bill"?—EDITOR.)

Mr. Skidmore Highly Approves of Mr. Fearn so it Is Well To Have this Letter Appear Along with "Wild Bill's" Emanation

Editor, AMAZING STORIES:

I felt I must say a word *in re* May '35 **AMAZING STORIES.**

Cover illustration is nice: I'm always pleased when the mechanical horrors are left off cover page. Morey is a splendid illustrator and prolific, too: I notice the volume of illustrations he turns out for your different magazines.

Your own editorial is splendid. I particularly like your references to Vinci's, Ovid's, Chanute's, and Roger Bacon's works.

David Keller is at his usual philosophical best in "The White City." Keller sure knows his human equations and reactions. I would like to know him personally.

John Russell Fearn has a wonder story in his serial "Liners of Time." The story theme is a great idea: it's clever, thought stimulating, and amazing. In this first installment, Fearn does mighty interesting tricks backward and forward along the time stream. I'm looking forward with keen anticipation to the remainder of "Liners of Time"; and I have the feeling that Fearn will keep up the breath-taking plot action and science used in first installment.

Two or three points of science appearing in "Liners of Time" tempted me to write in with a critical, controversial pen; but the points I dispute are trivial compared to the grand aggregate worth of the story. So I

refuse to look for flaws in a valuable gem with a hyper-critical microscope. As an author, I know how that goes.

And, too, American writers will do well to note the splendid literary style of this English writing chap, Fearn. "Liners of Time" is one of the best-written Mss. that have appeared in **AMAZING STORIES.** The punctuation in this story is a high academic standard. Fearn inspires one to do better writing.

Stanton A. Coblentz presented an amusing idea in "Older than Methuselah" with a nice legendary background. I enjoyed it.

"The Gypsies of Thos" is odd and interesting; it's a good "Amazing" yarn.

Modesty and good taste forbid my opinion of "A Saga of Posi and Nega": so, I will simply say that Morey's illustration for the story was stupendous!

JOSEPH WM. SKIDMORE,
145 No. Louise St.,
Glendale, Calif.

(We have to blush at your comments on the Editorial. Our human nature makes us highly appreciative. We are glad to have some English authors as contributors in order to give the American readers an idea of how our Transatlantic brethren write.—EDITOR.)

Back Issues Wanted and a Few Words of Appreciation

Editor, AMAZING STORIES:

I have back numbers of several magazines that your readers may like to get hold of. As follows:

AMAZING STORIES—1930, monthly, 1 Sept. quarterly, 1 fall 1931, all including quarterlies. 1932, all except May, Sept. All quarterlies. 1933, all monthlies, spring-summer and winter quarterlies. 1934, all months except Aug. and one quarterly. 1935, all to date.

Popular Science—1930, Jan., June, July, Aug., Sept., Oct., and Dec. 1931, all except July. 1932, all except July. 1933, all. 1934, all. 1935, all to date.

Astounding Stories—1934, Jan., June, Aug., Oct. and Dec. 1935, Jan. to May.

Wonder Stories, Monthly—1934, Aug. to Dec. 1935, all to date.

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T. A. LITTLE,
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I'll give you PROOF in 7 days that I can turn you, too, into a man of might and muscle. Just think of it! Right in the first week under my guidance you will see and feel the improvement! Then as my weekly instructions arrive in your home you continue to re-build, renew and "overhaul" your body. By the end of three months you are the owner of a powerful body that you will be proud to display on the beach this summer. People will notice the ruddy glow of health in your face, the sparkle in your clear eyes, your broad shoulders and they will seek your company. You will be the fellow who will walk off with the prettiest girl and the best job while the others wonder how you did it!

Write your name and address carefully on the coupon below. I'll send you absolutely free a copy of my new book, "Everlasting Health and Strength." It reveals the secrets that changed me from a 97-pound flat-chested weakling into a husky fellow who won the title of "The World's Most Perfectly Developed Man" against all comers! And it shows how I can build you into an "Atlas Champion" the same way.

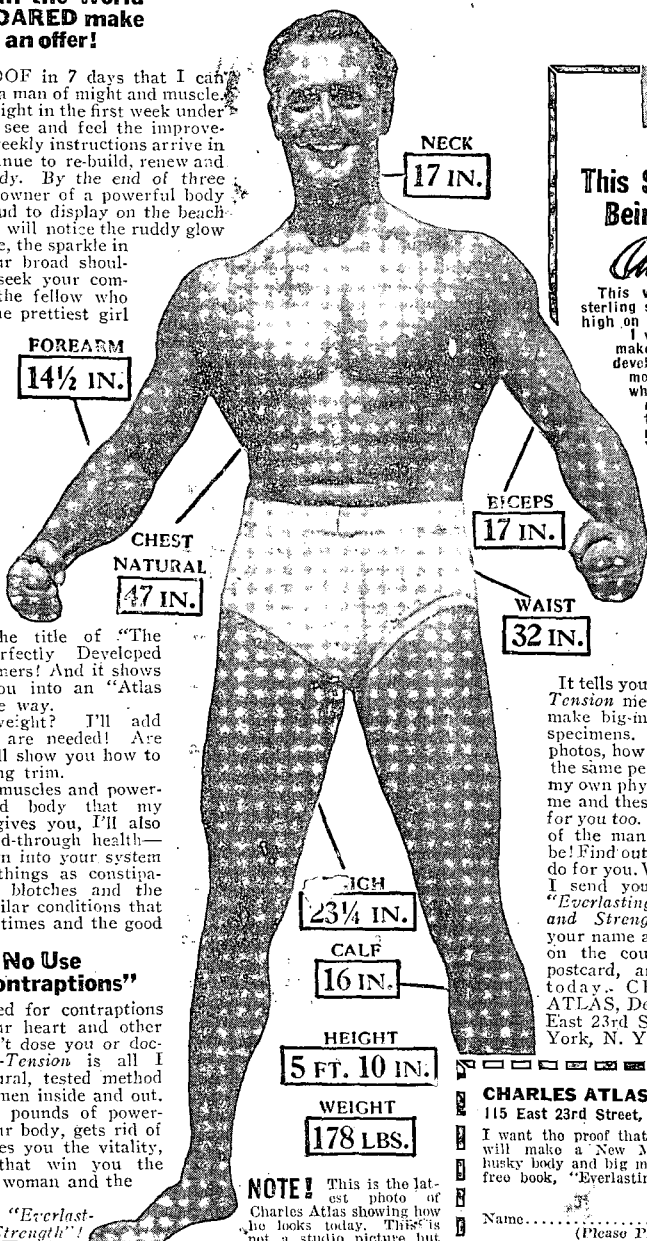
Are you underweight? I'll add pounds where they are needed! Are you fat in spots? I'll show you how to pare down to fighting trim.

And with the big muscles and powerful evenly-developed body that my method so quickly gives you, I'll also give you through-and-through health—health that digs down into your system and banishes such things as constipation, pimples, skin blotches and the hundred-and-one similar conditions that rob you of the good times and the good things of life.

I've Got No Use At All for "Contraptions"

I haven't any need for contraptions that may strain your heart and other vital organs. I don't dose you or doctor you. *Dynamic-Tension* is all I need. It's the natural, tested method for developing real men inside and out. It distributes added pounds of powerful muscles over your body, gets rid of surplus fat, and gives you the vitality, strength and pep that win you the admiration of every woman and the respect of any man.

Get my free book, "Everlasting Health and Strength!"



NOTE! This is the latest photo of Charles Atlas showing how he looks today. This is not a studio picture but



This Sterling Silver Being Given Away

Charles Atlas

This valuable cup, made of sterling silver, stands about 14 inches high on a black mahogany base.

I will award it to my pupil who makes the most improvement in development within the next 3 months. Therefore, no matter what your measurements now, you have an equal chance to win this cup for permanent possession—after you have received your free book.

YOUR name engraved on the cup! Get my free mailing coupon by filling out the coupon WITH the book. I will send you full information about this "Atlas Championship TROPHY."

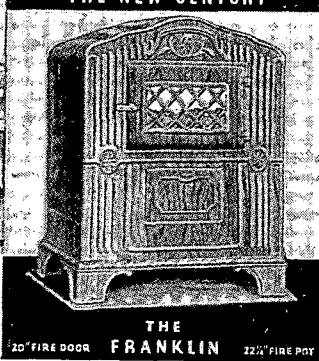
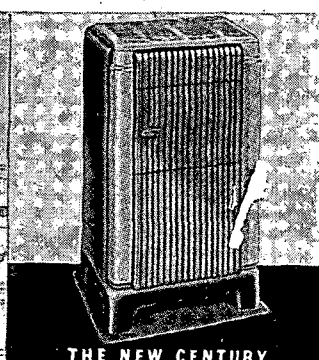
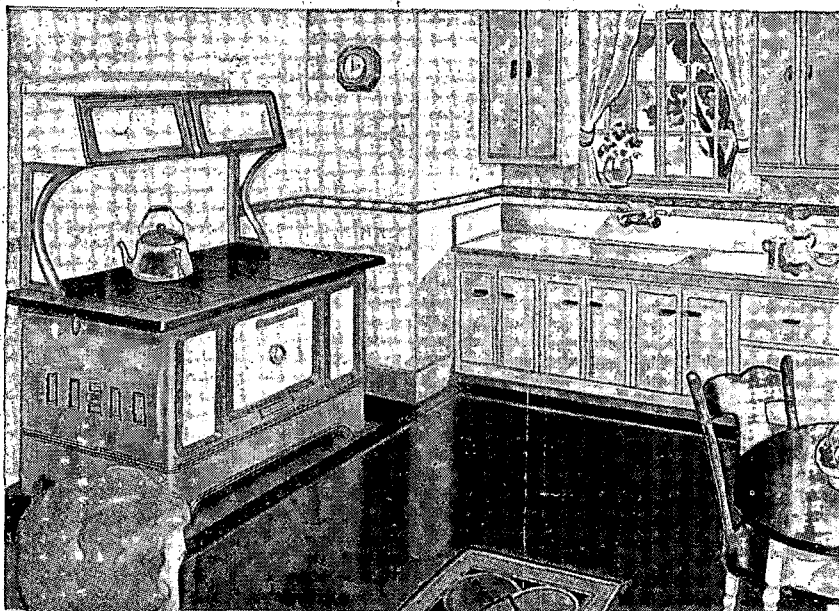
48-PAGE FREE

It tells you all about my special *Tension* method, and what it can do for you. It shows you, in photos, how I have developed my own physique. What my system does for me and these hundreds of other men and women who have benefited from it. Don't keep on being the man you CAN be! Find out what I can do for you. Where shall I send your copy of "Everlasting Health and Strength"? Put your name and address on the coupon, or a postcard, and mail it today. **CHARLES ATLAS, Dept. 99, 115 East 23rd Street, New York, N. Y.**

CHARLES ATLAS, Dept. 99
115 East 23rd Street, New York, N. Y.

I want the proof that your system of *Dynamic-Tension* will make a New Man of me—give me a husky body and big muscle development. free book, "Everlasting Health and Strength."

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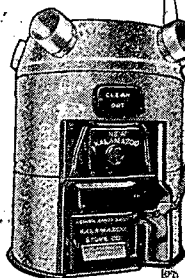
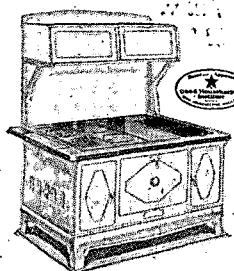
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